MINERALS
AND
MINING INDUSTRIES
in the areas served by the
CANADIAN NATIONAL RAILWAYS

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CANADIAN NATIONAL RAILWAYS

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CANADIAN NATIONAL RAILWAYS

CONTENTS.

MAPS

ILLUSTRATIONS

Preface

The object of this pamphlet, now in its fourth edition, is to interest mining groups to invest capital in mining and to stimulate enquiries regarding the minerals and mining areas in the territory served by the Canadian National Railways. The officers of the Department of Natural Resources are not only prepared to reply to such enquiries but also to co-operate in every manner possible with those interested in mining development.

The attention of prospectors and those interested in mineral development is particularly directed to opportunities in the promising areas served by the Canadian National Railways. The varied resources of Nova Scotia and New Brunswick; of Northwestern Quebec; Northern and Western Ontario; Northern and Southeastern Manitoba; and British Columbia; the most favourable fields open to prospectors remaining on the globe.

Many of the most conservative authorities believe that the day is not far distant when the eyes of the whole world will be focussed on the mineral riches of Canada, rapidly becoming one of the world's leading mineral producers. We are, undoubtedly, on the eve of a remarkable development; already mineral deposits of great value have been uncovered in nearly every Province in Canada. Capital wisely spent in this country, particularly in the development of promising prospects, will, if sound judgment is displayed, yield generous returns, especially in the new areas opened up by the Canadian National Railways where it is demonstrated that the formation is favourable to mineral deposition.

It should be borne in mind that responsible groups, and men of standing and integrity, are engaged in mining in Canada, and have made a financial success of their operations. It should also be remembered that the rapid development of mining during the past two decades has resulted in building up a corps of eminent geologists and engineers, many of them of international reputation, n whom the greatest confidence can be placed. Thus, with the representatives of capital joining such forces, or employing those with such technical skill with wide experience in Canadian mining practice, it will be more conducive to success than under the more or less haphazard conditions under which many such ventures were entered into in years gone by.

We can point with pride to the fact that Canada is rapidly reaching second place as a source of gold supply; while the world at large shows a decrease in the production of gold, Canada is recording a continuous increase. That while possessing less than half of one per cent of the total population of the world, she produces the major portion of the supply of its nickel, asbestos, and much of its cobalt; that Canada is the largest producer within the British Empire of silver, copper, zinc, arsenic, gypsum, feldspar and talc, and its known resources far exceed the total estimated coal resources of the whole of the rest of the Empire; equal to one-sixteenth of the world's coal reserves.

The importance to the Canadian National Railways of the development of the country's mining industries may be realized when it is considered that a large portion of Canada is unsuitable for agriculture. Mining will thus become more and more an important source of tonnage due to the increasing and almost unbelievable demand in the world for metals and minerals. This condition has greatly stimulated prospecting, resulting in the finding of many new mineral bodies of great value, an indication of what the future holds in store in the large areas still to be examined.

This demand for metals is illustrated in a paper by Dr. Charles Camsell in which he says: "It has been estimated that in 1750, when the change towards modern conditions was just beginning, the annual output of iron for the entire world was not more than 200,000 tons. Within a century it had increased to 5,000,000 tons a year and in the year before the war it had reached nearly 80,000,000 tons. Some idea of the relative growth in the use of iron may be gained from the fact that since 1800 the population of the world has less than trebled, while iron out put has increased one hundred fold. It is the same with copper shows an increase in the last century of over one hundred fold. If we were to examine the condition of the other minerals, both metallic and non-metallic, and especially those used mainly for industrial purposes we would find a similar rate of growth. In fact, C. K. Leith makes the astounding statement that more minerals have been produced and used in the last twenty-five years than in all preceding time. This is a remarkable situation when we consider that the use of metals goes back over 6,000 years and the use of minerals into the obscurity of the Stone Age. It is also illustrative of the rate of progress of modern civilization and the place that minerals occupy in our present day industrial life".

It may not be out of place to point out briefly, a few features of Canada's remarkable progress during the last thirty years, not only in mining but in every field. The value of our mineral production has risen from less than $23 million to over $241 million in 1926; our water power development, the potent force behind our mining, pulp and paper and general industrial development, has risen from a few thousand horse power to 4,556,000 horse power; the export of pulp and paper, from practically nothing to $173 million; and our foreign trade from $221 over $2,000 million, representing the largest per capita export in the world. Many other examples could be given, but these alone explain why Canada's progess is inspiring so much confidence in investors at home and abroad.

Introduction

The Canadian National Railways being transcontinental and serving the nine Provinces of Canada, it would appear desirable, in the first place, to give a general idea of the physical features of the country.

The general slope of the country is northward, some two million square miles, or over half, draining into the Arctic Ocean and Hudson Bay, an area of about one and a half million square miles draining into the North Atlantic, and about half a million square miles on the western coast, beyond the Rocky Mountain Range into the Pacific. A comparatively small area, less than thirteen thousand square miles, lying at the southwest of the Western Provinces, drains into the Gulf of Mexico.

The Maritime Provinces, and the southeast portion of the Province of Quebec, constitute the northern end of the Appalachian Mountain System. It contains valuable coal fields and a number of minerals of economic value. What has been termed the "Acadian Highland" occupies Gaspe Peninsula and a portion of the Eastern Townships. Joining this to the West, lie the lowlands of the St. Lawrence basin, the formation of which is Palaeozoic.

What may be described as the main framework, geographically and geologically, of the Dominion is the "Archean" or pre-Cambrian shield, a huge U-shaped area stretching from Labrador across the southern basin of Hudson Bay almost to the basin of the Mackenzie, its base resting on Southern and Central Ontario near the Thousand Islands and a portion of the tip penetrating New York State. This area, underlain by rocks of pre-Cambrian age, promises to be perhaps one of the greatest mineral treasure houses in the world; nowhere are the pre-Cambrian rocks represented by more important metallogenetic epochs than in this area.

The major portion of this country is unsurveyed and unprospected; still sufficient is now known of its geological structure to provide evidence of its latent wealth. The copper-gold deposits of Northwestern Quebec; the nickel-copper mines of Sudbury; the silver of Cobalt, South Lorrain, Miller Lake and Gowganda; the gold of Porcupine, Kirkland Lake and areas contiguous in the Provinces of Manitoba and Quebec; the iron, gold, silver and other ores of Thunder Bay and Rainy River mining districts; copper, gold, and various other minerals in The Pas district of Manitoba, all give some idea of what the future holds for Canada, within the folds of this great region—the greatest single exposure of pre-Cambrian rock in the world—greater than all others added together. In view of what has been said in the foregoing as to the nature of the formation of the Archean Shield, it is, indeed, probable that phenomenal discoveries will continue to be made from time to time. It must be borne in mind that at present only a minimum of work has been done by men who have, more or less, rapidly covered the country contiguous to its waterways.

It is important to observe that while only a small portion of this area, probably not five per cent, projects southwest of Lake Superior, in it is found one of the richest mining districts in the world, containing the Lake Superior iron mines, producing the greater portion of the iron ore used in the United States, and the famous copper deposits of Michigan, which have produced for many years more than one hundred thousand tons of copper annually and which still contain large reserves of ore.

To the west and southwest of the Laurentian Plateau is the great Interior Plain, constituting the larger portion of Manitoba, Saskatchewan and Alberta. This territory is one of the most fertile agricultural districts in the world, and within it are contained the beds of post-glacial lakes which account for the clay subsoils, which, with their rich covering of vegetable matter, contribute to its productive growth. This territory is largely underlain by a rock formation of later Cretaceous age, containing coal in great abundance, also clays.

Little is known of that portion of the pre-Cambrian area in portions of Northern Saskatchewan and Alberta and in the Northwest Territories, but the reports of explorers who have penetrated to the mouth of the Copper Mine River and Bathurst Inlet, and that portion known as Copper Mountain, agree that the geological formation is very similar to that found in the famous copper producing districts of Michigan, already alluded to.

Bordering the great Interior Plain is that which has been termed another "geological province," i.e., the northern projection of the great Cordilleran Range that extends over the whole western coast of North America and covers a territory in Canada, approximately thirteen hundred miles north and south by four hundred miles in width. It includes the mountainous region of British Columbia and the Yukon. It has vast possibilities, and the extent of its mineral resources are assumed to be very great, but only a small portion of it has been surveyed or prospected. This magnificent range of mountains constitutes one of the greatest attractions Canada has for visitors. The mountains generally range in elevation from eight thousand feet to that of Mount Robson, thirteen thousand and sixty-eight feet.

The origin of mining is very remote, even prior to the time of Tubal Cain, recorded by Moses as "instructor of every artificer in brass and iron" for it is evident that there must have been mines and miners before there could be artificers in metals. It should be realized, however, that the advent of these arts marked a great epoch in the advancement of the human race, the progress of which has been inseparably connected with, and largely dependent upon, development in mining and metallurgy.

Mining and metallurgy in Canada may be said to have had its origin in Cape Breton some two hundred years ago when coal and iron were mined and manufactured into cast and wrought iron, but the genesis of active mining may very properly be attributed to the work of the Geological Survey. Such a survey authorized by the Provincial Government was commenced in 1843 under the direction of Sir William Logan, and was pushed with such remarkable energy that in 1863 a "Geology of Canada," a voluminous document, was published dealing with the southern portion of Quebec and Ontario. From

that time onward exploration, surveying and mapping of the country has been continued, until in recent years under the direction of the Dominion Department of Mines, we have an earnest, self-sacrificing corps of geologists and technical men, who are rendering a service of value to Canada which is impossible to gauge.

Coincident with the progress of geological surveys there has been inaugurated an era of prospecting and mining development, stimulated by a regular succession of discoveries that have resulted in the establishment of an industry, the potentialities of which are incalculable.

The term "pre-Cambrian" referred to, includes a complex group of rocks from very metamorphosed and often highly schistose members to quite fresh-looking little disturbed rocks among its youngest. A large portion of the pre-Cambrian consists of granite-gneiss into which glacial erosion has cut deeply and as the Department of Mines, Ontario, points out, "removing from broad areas overlying rocks in which metalliferous deposits are likely to occur." These areas of granite-gneiss to which the name "Laurentian" is usually applied have not proved favourable for gold deposits, hence the erroneous theory was taught previous to the realization of the natural resources of Northern Ontario, that gold deposits did not exist in the pre-Cambrian rocks and this teaching has had much to do with the scepticism abroad, in the past, with relation to our gold areas. However, as pointed out by the Ontario Department of Mines, scattered through the pre-Cambrian are ancient rocks, usually dark-coloured and of volcanic origin, believed to be about the earliest formed on earth. They are lava flows, tuffs and agglomerates, which with some iron formation are termed the Keewatin. Another old series of later age than the Keewatin but also very much altered, consists of conglomerates, greywacke, slate and quartzite, the layers usually standing on end; these rocks are the Temiskaming series. The series occurs as remnants lying in synclinal folds on the Keewatin *The Keewatin and Temiskaming rocks are favourable formations in which to prospect for gold, particularly where they have been intruded by granites syenites, quartz porphyry and feldspar-porphyry of Algoman age.* Prospectors in Northwestern Quebec, Northern Ontario and Manitoba now look for areas where the Keewatin and Temiskaming rocks are altered to schists and in which shear zones have been developed indicated by a rusty-weathered surface, due to the oxidation of iron in the carbonates and in iron pyrites. Where light-coloured instrusions occur with the schists, a good area for prospecting is indicated.

PRE-CAMBRIAN AREAS OF NORTH AMERICA

GENERAL

BRITISH COLUMBIA

The area of British Columbia is about 372,000 square miles. Of this, only a small part has been closely and carefully prospected. There are, at least, over 200,000 square miles of country more or less extensively mineralized that still remains as a virgin field for the prospector, also for the investor in numerous undeveloped prospects, or discoveries that have not been developed into mines. It will thus be seen how vast are the opportunities in this field, equalled in few other places in the world.

Recent development has directed much attention to the country contiguous to the Canadian National lines in British Columbia, more particularly between Prince George and Prince Rupert, also along the North Thompson and Fraser Rivers.

In the vicinity of the Coast Range Batholith, valuable discoveries have been made including copper, lead, zinc, silver and gold. Active development has been carried on to a sufficient extent to indicate the economic value of these deposits, though operations at large are being retarded by the lack of customs smelting facilities in the area, as only the very rich ores can stand the cost of transportation and reduction charges to the distant points where smelters are located. Up to the present time, no body of ore has been developed in the interior of sufficient magnitude to support a smelter, though it is possible that the discoveries near Topley, or the zinc-lead deposit on the Ingenika River, forty-five miles from Fort Grahame, may yet prove to be of such a character. The fact remains that the establishment of a smelter would be a stimulus to mines operating at the present time and a greater incentive to men in the field.

Referring to the Coast Range, geologists draw attention to the character of the mineral contents of ore deposits found in the two flanks of the batholith. Those along the Western or Pacific belt are characterized by copper-bearing minerals, whereas the Eastern or Interior belt contains deposits in which galena, silver and zinc blende are the principal minerals. As pointed out by the late W. L. Uglow, "with few exceptions ore deposits in the Province are located either in the immediate vicinity of igneous rocks or in areas which are characterized by igneous intrusions and there is little doubt that a genetic relationship exists between them. With this connection established, one can say with a great deal of assurance that the favourable grounds for prospecting are around the marginal portions of intrusive rocks. There is a great granitic belt occupying the heart of the Coast Range, stretching from the International Boundary to Alaska, and a large number of smaller and apparently isolated intrusive bodies occurring in the Interior. These two sets of intrusives are the great mineralizers of the Province and their unexplored boundaries constitute the chief hope of an expanding mining industry. The country rocks in the vicinity of the intrusives are generally the hosts of ore and amongst them are structures and lithological types which are favourable to ore deposition." Mr. Uglow further points out that "a study of the ores so far developed has shown them to be in a measure primary in character and to have been formed by ascending solutions. These characteristics bespeak permanency in the sense that, other things being equal,

the deposits should be fairly persistent and uniform to moderate depth. The possibilities in the western part of the Province are excellent and depend on the prospecting of the edges of the Coast Range Batholith of which there are unexplored gaps of 300 miles in length; while the prospects in the interior depend on the exploration of the country in the neighbourhood of known bodies of intrusive rock." It may be pointed out that the Pacific Coast Batholith, which extends for 3,000 miles in the United States and Mexico, has produced four million dollars for every mile in length, and there is no reason why such should not be the case in Canada.

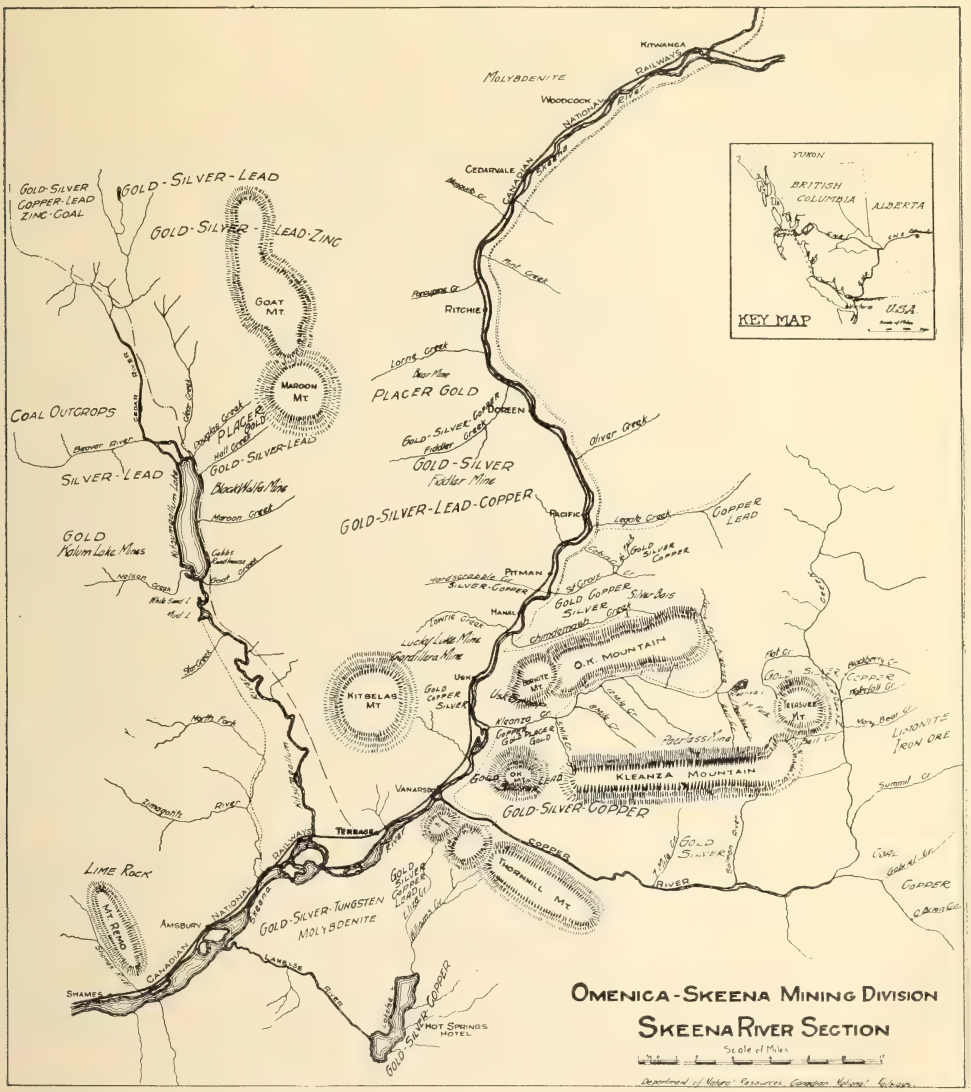
The attention of field engineers and others interested is directed to the many promising prospects which exist in Central B.C., some of them ideally situated as far as transportation and mining facilities are concerned. As pointed out by the B.C. Department of Mines "these properties show good values on the surface and should, generally speaking, appeal to the operating engineer." What this area needs is new capital for exploration and prospecting. Exploration syndicates or companies formed to develop prospects to a stage where they would interest mining companies, would find this area of B.C. a promising field. One essential of such an operation would be that it should be manned with the proper technical staff to direct the development of selected prospects which could be secured under bond. Mr. J. D. Galloway, Provincial Mineralogist, recently made a very significant statement bearing upon this aspect of the case: "In the past comparatively few mines in British Columbia have been 'found'; most of them have been 'made' by intelligent development and abundant opportunities still remain for the capable examining engineer to recognize the hidden merits of many prospects."

However, without doubt there is more confidence and enthusiasm being shown in mining and more activity than ever before in the history of the Province. As will be seen from the Government returns, mining is in a remarkably healthy condition with a continually increasing output. A number of causes have contributed to this much improved position; better practice in mining, milling and reduction, the great success achieved in treating lead-zinc ores, the stimulus given by continued successful operations in the Portland Canal and Nass River area. Another important factor has been the progressive policy of the Provincial Government in building motor roads throughout the Province and branch roads giving access to various mines, also new trails built to open up mineralized areas for the prospector. Neither must we overlook the splendid work done by the Dominion Geological Survey and by the officers of the Provincial Department of Mines, who have also played a most important part.

The following is a brief summary of activities contiguous to the Canadian National Railways. Near Terrace, 95 miles east of Prince Rupert, a number of claims are being developed at Kitsumkalum Lake, Maroon Mountain and Thornhill Mountain, on which are found quartz sulphide veins containing free gold, also deposits consisting of more or less complex ores. Vanarsdol has been the scene of much activity and some excellent showings of lead and silver have been discovered. East of this, near Usk, there are a number of favourable prospects where development work has been carried on at Kleanza and Chimdemash Creeks, and Kleanza Mountain. On Legate Creek, reached from Pacific

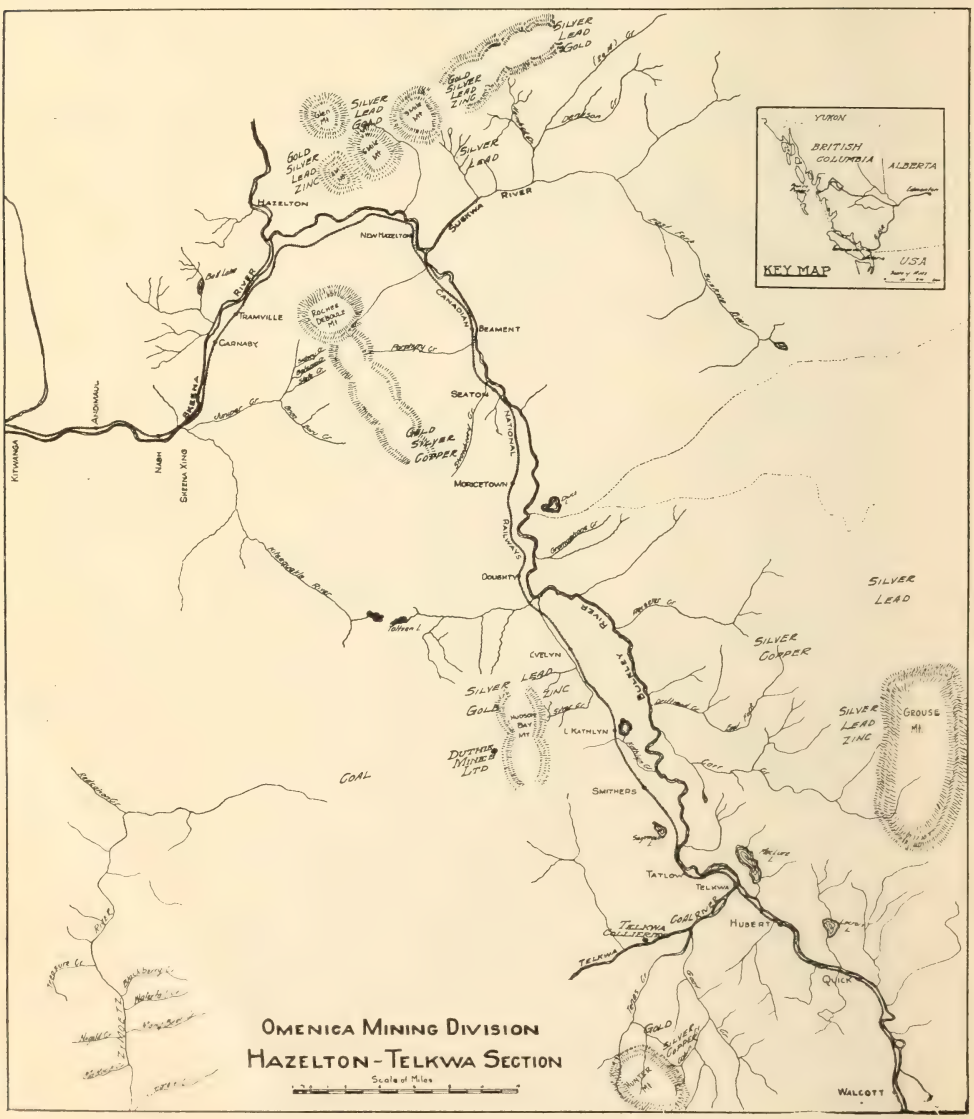
Station, there are a number of prospects showing great promise. On Fiddler Creek, reached from Doreen, there are also some most encouraging showings.

In the Hazelton section, high-grade silver-lead properties are being developed in the Babine Mountains where veins have been uncovered ranging from two to ten feet wide. Active development is being carried out on various properties on Rocher DeBoule Mountain, on Four Mile Mountain and Nine Mile Mountain.



On Hudson Bay Mountain near Smithers, the Henderson mine has disclosed new rich ore bodies of silver-lead and shipments are being made regularly. A concentrator has been erected on this property. Much activity has been stimulated in the Smithers district generally by the local branch of the B.C. Chamber of Mines. Great activity is being displayed near Topley, 59 miles east of Smithers, where discoveries of gold-silver of importance were made in 1926.

In the North Thompson River area an outstanding feature has been the opening up of the gypsum deposits at Falkland on the Kelowna Branch of the Canadian National Railways from which a large tonnage is being shipped to a plant at Port Mann. Development is proceeding in the Louis Creek, Barriere River, Chu Chua, Birch Island, Vavenby district and the Clearwater Valley. The Homestake Mine, Adams Lake, a silver property, has taken on a new lease of life and is stimulating prospecting in that area. In the Chu Chua area the more important properties are the Windpass, Gold Hill and Red Top groups. The results achieved at the Windpass have rendered the area of interest to prospectors, the attractive feature being a granite intrusion, the core of which is Mount Baldie, lying a little east of Chu Chua. The veins so far discovered are in rocks on the western contact of this granite. At Chu Chua, there are coal measures upon which some development work has been carried on. In the




OMENICA MINING DIVISION
TELKWA - ENDAKO SECTION
KEY MAP
YUKON
BRITISH COLUMBIA
ALBERTA
USA
Scale of Miles
TELKWA
HUBERT
QUICK
WALCOTT
BARRETT
HOUSTON
KNOCKHOLT
PEROW
TOPLEY
FORESTDALE
ROSE LAKE
PALLING
DECKER LAKE
BURNS LAKE
TINTAGEL
SHERATON
PRIESTLY
SAVORY
ENDAKO
BULKLEY
RIVER
MORICE
MacLURE LAKE
GROUSE MT
GOLD SILVER COPPER LEAD ZINC
HOUSTON MT
SILVER COPPER
RED TOP
TAYLOR GROOP
GOLD SILVER LEAD COPPER ZINC
BLACK MT.
CUP GROOP
HUCKLEBERRY MT
BABINE
LAKE
GOLD SILVER COPPER ZINC
SILVER ISLAND MINING CO
TALTAPIN MINING CO
GOLD SILVER COPPER LEAD ZINC
TALTAPIN MT
TALTAPAN LAKE
CUNNINGHAM LAKE
DAY LAKE
BULKLEY LAKE
MAXIM LAKE
DECKER LAKE
BURNS LAKE
ENDAKO
RIVER
MONA GROOP
GOLD SILVER LEAD
GOLD
TCHESINKUT LAKE
GOLD COPPER SILVER ZINC LEAD
SILVER QUEEN GROOP
CASTOR LAKE
GOLD SILVER LEAD ZINC COPPER
OWEN LAKE
NADINA MT.
GOLD SILVER COPPER LEAD ZINC
POPLAR LAKE
FRANCOIS
LAKE
MOLLICE LAKE
TAKYSIE LAKE
GREYSTOON LAKE

Birch Island area, on Foghorn Creek which empties into the North Thompson River from the south, there are several properties of promise, also in the Vavenby area.

A district that must eventually attract attention is situated in the angle between the line to Prince Rupert and that running to Vancouver and lies west of Albreda and south of Tete Jaune Cache. One group of claims has showings of great magnitude carrying high values in lead-silver and ore carrying copper-gold. One of the lodes is reported to be 22 feet wide, with stringers of from two to five feet thrown out in a northwesterly direction.

Other operations that might be mentioned are marble on the shore of Desert Creek, Nootka Sound, Vancouver Island; talc at Wolfe Creek, Victoria-Cowichan line; cinnabar, (ore of mercury) at Copper Creek, south of Kamloops; magnesium sulphate at Epsom; promising mica claims on the Finlay River north of Prince George and on Mica Mountain.

Another discovery of importance was made in the vicinity of the Ingenika River, north of Fort Grahame, where large deposits of lead-zinc were disclosed. The area is in the pre-Cambrian and has, topographically and geologically, characteristics similar to those which produced the great Sullivan mine and other famous lead mines in East Kootenay.

The mining laws of British Columbia are very liberal in character and compare favourably with those of any other part of the world. The title for mineral claims and hydraulic leases are particularly sound.

Free Miners' Certificates.—Any person over the age of 18 or any joint stock company may obtain a free miner's certificate on payment of the required fees. Individual certificates five dollars. A company capitalized at one hundred thousand dollars or less, $50.00. Over that amount $100.00. The possession of this certificate entitles the holder to enter upon all lands of the Crown, or other lands on which the right to so enter is not specially reserved, and to prospect for minerals, locate claims, and mine.

A free miner can only hold, by location, one mineral claim on the same vein or lode, but may acquire others by purchase. In the case of placer claims, only one claim can be held by location on each creek, ravine, or hill and not more than two in the same locality, only one of which shall be a "creek claim."

Mineral Claims.—Mineral claims are located and held under the provisions of the "Mineral Act." A mineral claim is a rectangular piece of ground not exceeding 1,600 feet square. The angles must be all right-angles, unless the boundaries, or one of them, are the same as those of a previously recorded claim.

A mineral claim is located by erecting three "legal posts" which are stakes having a height of not less than four feet above ground and squared for four inches at least on each face, or not less than a foot from the top. A tree stump so cut and squared also constitutes a legal post. The "discovery post" is placed at the point where the mineral in place is discovered; numbers one and two posts are placed as near as possible on the line of the lead or vein shown by the discovery post and mark the boundaries of the claim. The location line between numbers one and two posts must be distinctly marked—in a timbered locality, by blazing

trees and cutting underbrush, and in a bare country by monuments with earth or rock not less than two feet in diameter at the base and at least two feet high.

Mineral claims must be recorded in the Mining Recorder's office in the Mining Division in which they are situated within 15 days of the date of location, one day extra being allowed for each ten miles of distance from the Recording Office over and above the first ten miles. Mineral claims are, until crown granted, held practically on a yearly lease, a condition being that during such year assessment work of at least $100 be performed, or payment of such sum to the Mining Recorder. When assessment work of $500 has been recorded, and survey made of claim, owner is entitled to Crown grant on payment of $25.00.

Taxation.—Crown granted mineral claims are subject to a tax of twenty five cents per acre, unless $200 or more has been expended on development work during the preceding year. A mineral tax of 2% is levied on ores and other mineral substances mined in the province. Mines are also taxable on income earned, if such tax exceeds the mineral tax. Should the income tax prove the greater, the mineral tax for the period in which income tax was earned is counted as part payment of income tax.

For copies of Mining Regulations and other publications, application should be made to the Department of Mines, Victoria, B.C.

ALBERTA

The mineral resources of Alberta that are being actively exploited are coal, natural gas, petroleum, salt, alluvial gold, clay and quarry products. The coalfields of this Province include anthracite, bituminous, semi-bituminous and lignite and are the most extensive in Canada. The output of coal is now the largest of any of the Provinces of Canada. Natural gas is found over wide areas and is being put to extensive industrial use. Petroleum is now produced in several localities, including the Turner Valley, Wainwright and Fort Norman, and an extensive drilling campaign is being conducted that in the opinion of many authorities may lead to the discovery of one of the largest oil pools in the world. In the north there are large areas of bituminous sands, valuable beds of salt and gypsum and refractory clays which so far have only been exploited to a very limited extent.

As in the case of Manitoba, and Saskatchewan, the natural resources of this province are administered by the Dominion Government and the regulations are similar to those described under those provinces. There are, however, various provincial laws governing the operation of mines.

Under the Alberta Mines Act provision is made for the safe operation of mines in the province and applies to the mining of coal, shale, clay and other minerals. It requires that operations must be under control of duly certified officials.

The Mine Owners' Tax Act makes provision for the payment to the Government of tax at the rate of two per cent of the gross revenue received by the operator of the mine, this being accepted at the present time at the rate of five cents per ton on all coal sold.

The Mineral Taxation Act provides for the taxing of owners of mineral land at the rate of three cents per acre of the surface of such land and requires that every owner of mineral shall, before the first day of September in each year, forward to the Minister a statement showing the mineral lands in respect of which he is liable for taxation.

Other regulations include the Boilers' Act, embodying the construction of all boilers, etc., the Workmen's Compensation Act, the Coal Sales Act and the Corporation Taxation Act, which provides that every company which transacts business in the province and which is not specifically mentioned in the Act shall pay a tax of forty cents for every thousand dollars of its authorized capital, but this annual tax shall not exceed the sum of five hundred dollars.

SASKATCHEWAN

This Province is essentially agricultural and embraces an enormous area of level prairie land. There is, however, a growing output of non-metallic minerals, particularly in the southern part of the Province. In view of the important discoveries in Manitoba, close to the Saskatchewan boundary, greater attention will be directed to the unprospected territory in the north underlain by the same pre-Cambrian rocks that have proved mineral-bearing in other parts of Canada. Already, in the northern part of the Province, gold is known to occur in the pre-Cambrian rocks, a notable example of this being a discovery near Beaver Lake; there is also iron and copper near Lake Athabaska.

In the southern part of the Province clays are found of an extremely high quality suitable for the production of high-grade ceramics. There are also extensive beds of refractory clays used in the manufacture of stoneware, firebrick, various kinds of pottery and sewer pipe; also high-grade ball clays. Lignites are mined in the southern part of the Province at Estevan, Bienfait, Pinto, Roche Perchee and Dirt Hills district. Amongst the resources of the Province that will eventually prove of commericial value are natural deposits of sodium sulphate contained in more than 200 lakes.

Under the provisions of the Saskatchewan Mines Act a "mine" includes every shaft in the course of being sunk and any shaft level and inclined plane in such mine. Every mine in which 20 or more persons are ordinarily employed shall be under the daily supervision of a manager and pit boss. A manager or pit boss must be the holder of a certificate obtained by examination.

Provision is made under the Act for the inspection and examination of the working of any mine to the end that the provisions of the Act be complied with. No taxes, royalties, etc., on the mining output of the Province are imposed by the Provincial Government.

The natural resources of the Province are administered by the Dominion Government. Mineral lands may be leased under the regulations of the Dominion Lands Act, under the following terms and conditions:

Coal.—The maximum area which may be granted under lease to one applicant is 2,560 acres and the length of the location must not exceed four times its breadth. The rental is $1 per acre, per annum, and royalties on coal disposed of five cents per ton. Location must be staked by the applicant, who must file his application with the Mining Recorder for a lease. Such location must be

marked on the ground by two legal posts, one at each end of the longest dimension and a line must be marked out showing the posts.

Quartz or Lode Mining.—Any person 18 years of age or over may stake and acquire title to mineral claims. The maximum area of a location is 51.65 acres, being 1500 feet by 1500 feet or less and must be staked out on the ground in the same manner as a coal location and application made to the Mining Recorder for entry. The fee for entry is $10.00. The sum of $100.00 must be expended on actual development work on the location each year, or the equivallent paid to the Mining Recorder. Fee for renewal each year $5.00. When five hundred dollars has been expended or paid and discovery of mineral in place proven and a survey of the location made by a Dominion Land Surveyor, a lease will be granted for a period of twenty-one years.

There are special provisions governing placer mining, dredging, the mining of soluble mineral salts, production of carbon black, and quarrying, particulars of which can be secured on application to the Superintendent, Mining Lands Branch, Department of the Interior, Ottawa.

MANITOBA

The operation of metalliferous mining in this Province is comparatively recent, dating only from about 1910. Since that time discoveries of major importance have been made, the most notable of which has been the copper ore of northwestern Manitoba the values of which have been indicated by diamond drilling to the extent of approximately $250 million. One property alone, the Flin Flon, which has been diamond drilled for 900 feet in depth, has proved some $226 million of ore reserves.

Another outstanding feature is the result obtained in the Bull Dog-Long Lake area, east of Lake Winnipeg, where bodies of gold of magnitude have been disclosed, on the properties of the "Central Manitoba Mines", the "Mining Corporation of Canada" and others, greater than anything hitherto developed.

Approximately two-fifths of the total area of the Province, in the southern and southwestern sections, is agricultural, and is the main source of the non-metallic minerals. The remaining three-fifths is underlain by pre-Cambrian rocks and in it are found copper, gold and other metallic products. Amongst the non-metallic minerals found in the southwestern section may be mentioned gypsum, mined at Gypsumville; Portland cement, manufactured from limestone deposits near Lake Manitoba; brick and clay products obtained from widely distributed surface clays and shales; oil shales that may in the future prove of commercial value, occur throughout the Manitoba escarpment; lignite is found near Turtle Mountain; and sand for glass and foundry purposes is available at Black Island in Lake Winnipeg.

In recent years discoveries of widely different character have been made south of Oiseau River, and in a report on granite pegmatite of Southwestern Manitoba, Prof. J.S. DeLury draws attention to the presence of important lithium-bearing minerals, known as "lepidolite" and "spodumene", also to the presence of tin, tungsten and molybdenite. In lepidolite, two hither little-known valuable elements are found known as "rubidium" and "caesium."

In the Maskwa and Oiseau Rivers areas copper is found with nickel in associations suggestive of the Sudbury nickel deposit in Ontario.

The development of mining in Northern Ontario since the discovery of Cobalt, followed by that of Porcupine, Kirkland Lake, and later, Red Lake, has resulted in great advances in metallurgy, mining methods and a wider knowledge of the geological phenomena presented in formations in the pre-Cambrian area and this has greatly stimulated exploratory work in Manitoba. The mining districts are new and present exceptional opportunities for the prospector and mining capital.

The natural resources of the Province are administered by the Dominion Government. Mining lands may be acquired by lease for a period of twenty-one years, renewable for further periods of like duration under the following terms and conditions:

Quartz or Lode Mining.—Any person 18 years of age or over may stake and acquire title in mineral claims. The maximum area of a location is 51.65 acres, being 1500 feet by 1500 feet, or less, and must be staked out on the ground by two legal posts, one at each end of the longest dimension and a line must be marked out adjoining the posts. Application must be made to the Mining Recorder for entry. The fee for entry is $10.00. The sum of $100.00 must be expended in actual development work on the location each year and proved, or an equivalent amount paid to the Mining Recorder. Fee for renewal each year $5.00. When $500.00 has been expended or paid and discovery of mineral in place shown to have been made, a survey of the location made by a Dominion Land Surveyor, at the grantee's expense, and certain other requirements complied with, a final lease for a period of twenty-one years renewable is issued, subject to no further requirements, the rental for the full period of twenty-one years being $50.00.

Quarrying.—Dominion lands containing linestone, granite, slate, marble, gypsum, marl, gravel, sand, clay or building stone may be leased at an annual rental of $1.00 per acre. The maximum area to one applicant shall be forty acres.

For copies of the Regulations referred to, application should be made to the Superintendent, Mining Lands Branch, Department of the Interior, Ottawa, Ont.

ONTARIO

Ontario produces the greatest variety of mineral products of any of the provinces of Canada, as well as having the greatest output. It is probable that no part of the world is attracting more interest and this is resulting in a very intensive search for and development of mining properties.

As pointed out by the Ontario Department of Mines the mineral industry of the Province has three outstanding characteristics, namely rapid growth, great variety of products, and the domination of the world's markets in certain metals, such as nickel and cobalt. Though, as far as the latter is concerned, South Africa is becoming a serious competitor.

Outstanding in the recent march of events is the new development in the Sudbury district, where immense bodies of copper nickel ore have been developed at the Frood mine. Also, within the Sudbury basin a discovery of large bodies of zinc lead, indicating another mining operation of major importance. While sufficient development has not been carried on to determine fully the magnitude of the ore bodies, in Kamiskotia and contiguous areas, the results so far lead to the belief that new rich camps are in the making.

The principal metalliferous ores are the nickel-copper deposits of the Sudbury district, the zinc-lead found in the same area, the silver-cobalt-nickel arsenides of Cobalt and surrounding areas, the gold fields of Porcupine and Kirkland Lake and recently further important deposits of copper have been found.

The nickel deposits of the Sudbury district are the most important of the known nickel resources of the world. In addition, they furnish by-products of large amounts of copper and valuable quantities of platinum, palladium, gold and silver.

Ontario possesses many valuable economic minerals, including the largest deposits on the continent of talc, feldspar, mica and graphite. Other minerals are actinolite, apatite, arsenic, asbestos, cobalt, corundum, fluorspar, gypsum iron pyrites, lead, molybdenite, natural gas, petroleum, salt, and zinc, also valuable deposits of building materials.

Miner's License.—No one can prospect for minerals, acquire or hold unpatented mining lands, unless they are in possession of a miner's license, the charge for which is $5.00 per annum and entitles the holder to stake out three claims per annum for himself in any and every mining division and six more for license-holders.

Conditions Governing Stakings.—A mining claim in unsurveyed territory consists of a square of 40 acres, twenty chains to a side, and is staked out by planting four posts, No. 1 at the northeast corner, No. 2 at the southeast corner, etc., and by connecting the posts with blazed lines, if in a forest country, or with mounds of earth or rock where the land is bare.

Recording.—Fifteen days are allowed for recording claims with the Recorder of the Mining Division, and one additional day allowed for each additional ten miles distance from the Recorder's office.

Working Conditions.—After performing 200 days' work on a claim application may be made for a patent, but a payment must be made of $2.50 or $3.00 an acre, depending on whether situated in unsurveyed or surveyed territory.

The Provincial Assay Office at No. 5 Queen's Park, Toronto, is maintained by the Ontario Government of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work, under a schedule of charges which may be obtained on application.

Information respecting miner's licenses, mining laws, reports of the Department of Mines, etc., may be had on application to the Deputy Minister of Mines, Department of Mines, Toronto, Ont.

QUEBEC

Hitherto the mineral production of the Province has largely been confined to asbestos, lead-zinc and structural materials, including cement, clay products and stone. From now on it will be known as one of the most important copper-gold producers within the British Empire. The smelter at Noranda will probably be followed by a reduction works and a refinery in that part of the Province where cheap and abundant Saguenay power is available, which will provide electric energy for the efficient treatment of these metals.

Northwestern Quebec, the newly found and spectacular mining area, offers the prospector one of the most favourable fields for discovery and has the added advantage of easy means of access and communication. The Canadian National Railways runs through the southern portion of what is known as the Keewatin-Temiskaming formation, and also operates a branch line railway from Taschereau to Noranda—a distance of 44.4 miles, and serves the following places, in order of location, south from Taschereau: Lois, Clericy, Waite, Amulet, Boisvert, and Noranda which is the station for the towns of Rouyn and Noranda. The country, though more or less heavily wooded, is dotted with lakes and penetrated by large rivers such as the Hurricanaw and Kinojevis, which afford access in summer by steamer, motor-boat and canoe.

The geology of that portion of Northwestern Quebec known as Abitibi and Temiskaming counties, shows that it is underlain by the oldest formation known, generally grouped under the name "pre-Cambrian." The rocks of the region are volcanic of the Keewatin series, sedimentaries of the Temiskaming and Cobalt series and intrusive rocks of various geological periods, including younger granites, the deposition of the ores being due to magmatic solutions. It is a notable fact that the geology reveals formation favourable to mineral deposition on both sides of the Canadian National Railways from Senneterre west to beyond the Interprovincial boundary line between Ontario and Quebec, or, for 110 miles in the Province of Quebec. They stretch south of the railway thirty to forty miles and to the north they are seen to outcrop for upwards of one hundred miles. As pointed out in the report of the Department of Mines of the Province of Quebec, there is an area with at least ten thousand square miles of favourable formation where the Keewatin rocks predominate, presenting attractive ground to the prospector.

An outstanding feature of mining in this Province is the discovery of immense bodies of lead-zinc in the Gaspe Peninsula where extensive development is being carried on.

Other resources of the Province include copper pyrite, chromite, titanium ores, iron ore, molybdenite, magnesite, graphite, kaolin, phosphate, feldspar, mica, barytes, as well as fine marbles and building materials.

The Mining Laws in force in the Province of Quebec are liberal and favourable to the prospector. They provide for security of title.

Miner's Certificate.—Intending prospectors must secure from the Department of Mines or their Agent a miner's certificate, the charge for which is ten dollars. This certificate entitles the holder to stake mining claims on lands on which the minerals belong to the Crown, to a maximum area of 200 acres in claims of 40 acres each, in unsurveyed land, and in half-lots in subdivided

townships. After staking, the claim-holder must do 25 days' work on each claim of 40 acres.

Miner's License.—At the end of six months he may apply for the land outright in fee simple, or, if in doubt as to the value of the claims, apply for a working mining license for which he pays 50 cents an acre per year, and an annual registration fee of $10.00. If he desires to acquire the mining land in fee simple he must have the claim or claims surveyed by a Provincial Land Surveyor and pay the purchase price of $5.00 per acre for what are known as "superior minerals" (metallic or non-metallic, as described in the Mining Laws) or $3.00 for "inferior minerals". Before the expiration of the two years following, the applicant must spend $1,000 for each one hundred acres in bona fide mining work, when he is entitled to his patent.

The Quebec Bureau of Mines will give all information in connection with mines, mineral resources and mining regulations. Applications should be addressed to the Hon. J. E. Perrault, Minister of Colonization, Mines and Fisheries, Quebec, P.Q.

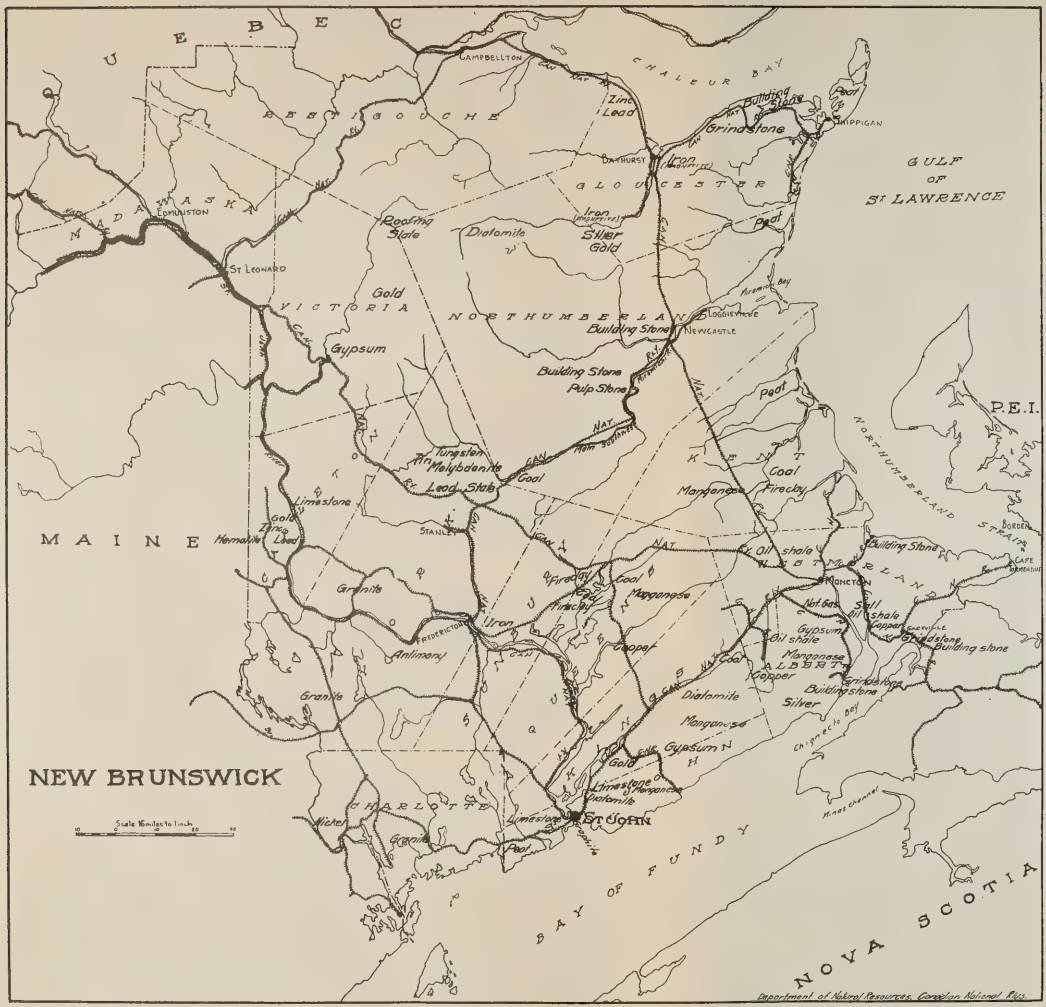
NEW BRUNSWICK

The mineral resources of this Province have not received the attention in the past they they have warranted. These minerals will undoubtedly prove a great source of wealth to the Province in the immediate future. One reason why the development of the industry has been retarded is the fact that a large portion of the area is covered with forests and overburden which make prospecting difficult.

The present intensive demand for minerals will without doubt result in stimulating prospecting all over Canada where the geology indicates the likelihood of mineralization. Such is the case in New Brunswick where these favourable formations occupy the largest area and where geological divisions from pre-Cambrian to Triassic are represented and such formations as Laurentian, Huronian and Cambrian, which elsewhere are most productive of metallic ores, also the Carboniferous, yielding coal.

Already it is known that the Province has a wide range of minerals, some of them quite rare, but for which new conditions and new processes, including the chemical industry, will create a demand. At present the mineral industry is mainly confined to the mining of bituminous coal and the quarrying of gypsum, stone, the production of natural gas and petroleum. Amongst the minerals found in this Province might be mentioned, ores of antimony, manganese, tungsten in the form of wolframite, iron in the form of magnetite, copper, silver, lead, tin and salt. Other mineral resources are large quantities of high-grade oil shales, associated with which in one of the deposits is albertite; high-grade clay, limestone and building stone, including a fine quality of granite; sandstone, from which grind stones, and pulpstones are produced. There are also deposits of diatomite in various parts of the Province.

The Mining Act of the Province of New Brunswick was revised in 1927. Under this Act there are three classes of rights, prospecting licenses, mining licenses and twenty year leases.


NEW BRUNSWICK
QUEBEC
MAINE
NOVA SCOTIA
P.E.I.
GULF OF ST LAWRENCE
BAY OF FUNDY
CHALEUR BAY
CAMPBELLTON
BATHURST
CHIPPIGAN
EDMUNDSTON
ST LEONARD
NEWCASTLE
MONCTON
STANLEY
ST JOHN
Zinc
Lead
Building Stone
Peat
Grindstone
Iron
Roofing Slate
Diatomite
Silver
Gold
Gypsum
Pulp Stone
Tungsten
Molybdenite
Lead
Coal
Manganese
Limestone
Oil shale
Granite
Antimony
Copper
Silver
Chignecto Bay
Minas Channel
Department of Natural Resources, Canada
National Parks

Prospecting Licenses.—A prospecting license is necessary before any search for minerals can be made. The charge for it is $10.00 and it applies to all lands in the Province open for prospecting. A license is good until the end of the calendar year and gives the holder the right to stake as many as ten forty-acre claims. These claims are square and one-quarter of a mile on each side. Every claim so staked must be recorded within thirty days at the office of the Mining Recorder in Fredericton. The fee is $1.00 for every claim recorded.

In order that mining rights on a claim may be continued beyond the last day of December in the current year, it is required that twenty-five days' labour shall have been performed; if there are more claims than one, and they are contiguous, the work of all of them may be performed on one or more. Should the work consist of boring, one foot of boring will be considered the equivalent of two days' work. A provision is made that should the date of recording the work performed be later than October 31st, or should the work be only partly performed, or, if for good cause shown, the prospector could not perform any of it, then on payment of $1.00 per claim the right to same may be extended throughout the next calendar year.

Mining Licenses.—At any time after the full amount of work has been performed the holder may apply for a mining license, the charge for which is $10.00 for each forty-acre claim. This license is valid for the year in which it is taken out and for the following calendar year, after which it may be renewed from year to year, at a cost of ten dollars for each claim, upon proof that twenty-five days' work has been performed on each claim during the preceeding period. In case of non-performance of work, it is left to the discretion of the Minister of Mines to renew the license on payment of $10.00 per claim, providing that the Inspector of Mines is satisfied that there was sufficient reason for the non-performance of the work.

Mining Leases.—The holder of a mining license who has complied with the requirements of the Act and has opened up and worked the mine for at least six months, will be granted a twenty year lease renewable up to eighty years. The rental is $10.00 a year for each forty acres.

The Provincial Government has a diamond drill producing 1-1–8″ and 2″ cores, capable of drilling to a depth of a thousand feet. This drill will be loaned for mining purposes under very favourable conditions, upon application to the Inspector of Mines at Fredericton.

For fuller particulars and copies of the Mines Act, application should be made to the Deputy Minister of Mines, Fredericton.

NOVA SCOTIA

Nova Scotia has always held an important position in the mining industry of Canada, and there is every indication that this position will be greatly improved as time goes on. Situated on the Atlantic seaboard, the facilities for water shipment are unexcelled, and naturally amongst the first products to be mined were those for which an export market could be found. With an improvement in mining and metallurgical methods and the world-wide demand for minerals of all kinds, the evolution in the chemical industry, the outlook for

Nova Scotia should steadily improve. Coal is the most important mineral mined and while the fields are not so extensive as those of the Western Provinces, they are more highly developed and the Province to-day stands second of the Provinces of Canada in the output of coal. Based on this raw material a large iron and steel industry has been built up at Sydney and New Glasgow, utilizing local fluxes and iron ore from Newfoundland.

The gold-mining industry, more or less dormant for a great many years, has taken on a new lease of life. It was prophesied many years ago that in spite of crude mining methods and mill practice Nova Scotia would some day have a gold-mining industry of great commercial importance and this prediction appears to be within the realm of fulfilment. The Department of Natural Resources of the Canadian National Railways, in co-operation with the Department of Mines of Nova Scotia, has carried on an economic survey of the more important goldfields and this has attracted the attention of mining engineers and mining capital.

Gypsum occurs in an area of over 75 square miles, from which this mineral has been shipped for over a hundred years. Amongst other mineral resources of the Province are included ores of manganese, barytes, tungsten, antimony, copper, lead and zinc, also arsenic. Beds of rock salt are being worked and there is every possibility of an important chemical industry being built up; sodium compounds in large quantities are being imported into Canada and a number of metals and minerals in the Province would enter into such an industry.

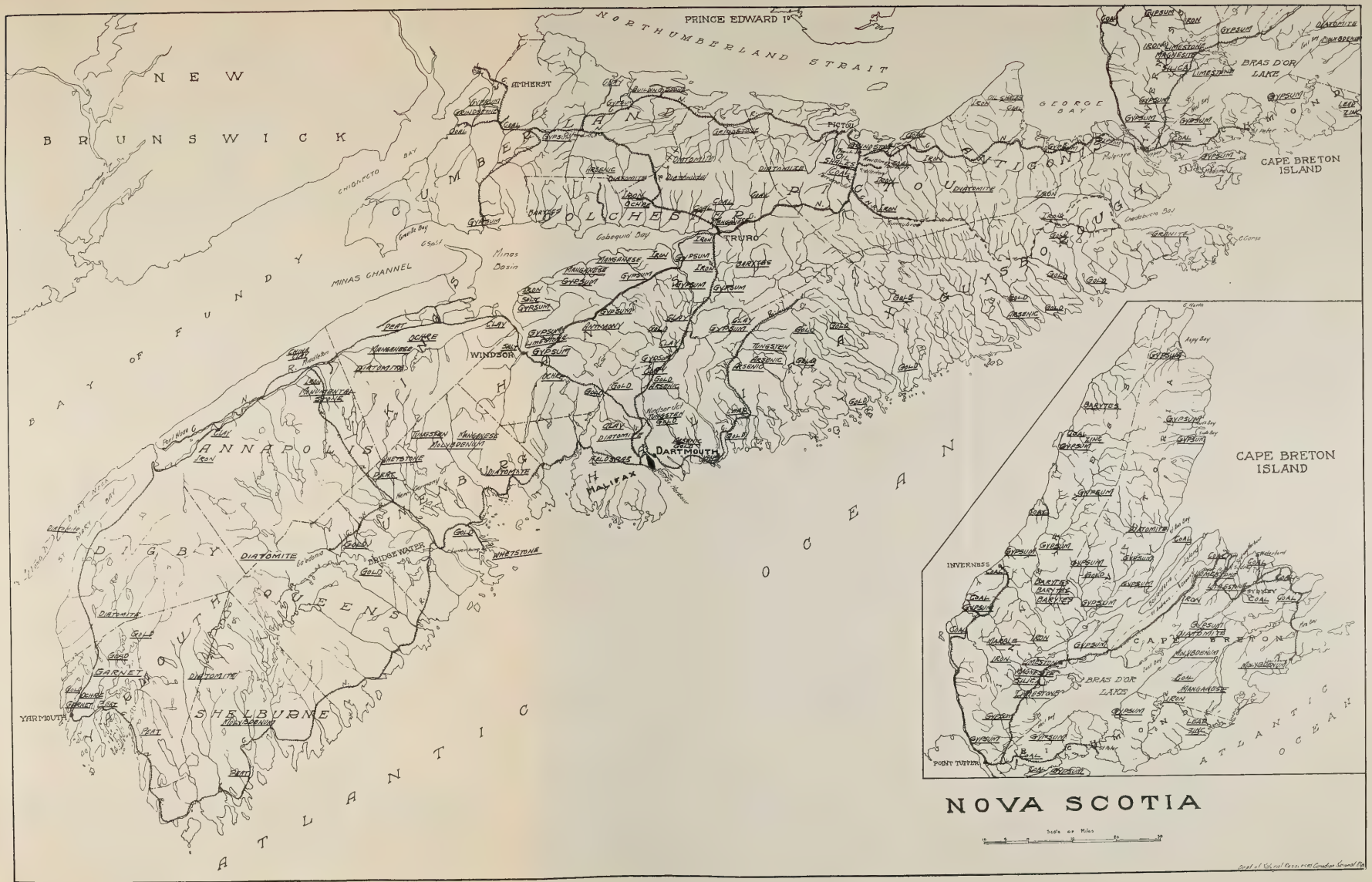
Diatomite deposits have been worked since 1896. From the widely distributed clay of the Province there is an annual output of brick, tile, and semi-refractory clay products. The rich oil shales of Pictou county will, in the course of events, prove a valuable source of oil. These deposits are amongst the largest of their kind in the world. Marbles, granites, and sandstones of excellent quality for building and ornamental purposes, are found in abundance, as well as limestone for building, fluxing or the making of lime. From blast furnace slag is produced cement and brick and also fertilizer. In the manufacture of coke, sulphate of ammonia and tar are recovered as by-products.

MINING REGULATIONS

With the exception of limestone, gypsum and building materials, all minerals in Nova Scotia are the property of the Crown. Minerals are divided into two groups (1) gold and silver; (2) minerals other than gold and silver.

Gold and Silver.—Leases may be granted on application to the Mines Office; they may contain any number of areas but not less than twenty. A fee of fifty cents must be paid with the application. Leases are subject to an annual rental of fifty cents per area, payable in advance. Areas are 250 feet north and south by 150 feet east and west.

Prospecting licenses, good for one year, giving the right to search for gold and silver, are issued by the Minister, but licenses are not issued for areas in a proclaimed gold district. A license may comprise not less than twenty areas; any number of licenses may be issued to the same person. Fees of fifty cents an area must accompany the application.


NOVA SCOTIA
PRINCE EDWARD I.
NORTHUMBERLAND STRAIT
NEW BRUNSWICK
BAY OF FUNDY
MINAS CHANNEL
ATLANTIC OCEAN
AMHERST
PICTOU
TRURO
WINDSOR
DARTMOUTH
HALIFAX
YARMOUTH
ANNAPOLIS
DIGBY
SHELBURNE
QUEENS
LUNENBURG
HANTS
COLCHESTER
CUMBERLAND
PICTOU
ANTIGONISH
GUYSBOROUGH
CAPE BRETON ISLAND
BRAS D'OR LAKE
INVERNESS
VICTORIA
POINT TUPPER
GEORGE BAY
Minas Basin
Gabeguit Bay
Chignecto Bay
Scale of Miles

Minerals other than Gold and Silver.—Licenses giving the right to search for and mine such minerals are granted by the Minister. Applications describing the tract and specifying the mineral, must be made in writing. In the case of a lease a fee of $50.00 must accompany the application or, for license to search only, $10.00. A license may cover a tract not exceeding one square mile and not more than two miles in length. A lease may cover a tract not exceeding one square mile and not more than two miles in length. A license is in force for a period of one year. The licensee may, at any time before the expiration of his license, apply for the licensed area under lease. A lease is for a period of twenty years and carries with it the right to obtain three subsequent renewals, each for a period of twenty years.

All licenses and leases are subject to compulsory work. In the case of gold and silver, the amount of work required is two days' work per year for each area of 250 feet by 150 feet. In the case of other minerals, the amount required, is equal to the work of one man for 100 days for each square mile or less, under license; and three men for 200 days for each square mile under lease.

In the case of a license, at least one-half of the work shall be performed within three months of the date of the license and the remainder within nine months. In the case of a lease only 300 man days need be performed during the first year of lease. The period of time between November 16th and April 15th inclusive is excluded for the performance of work. Applications for license or lease may be made by any number of persons. Where there is more than one person they shall nominate one person to whom the license or lease may be issued.

Ordinary leases are issued for coal under the above conditions and any number may be obtained by the same person, but with the authorization of the Governor in Council a special lease for coal may be obtained, particulars of which can be obtained from the Mines Office.

Royalties on minerals are payable as follows: Coal, 12 cents upon every ton of coal removed from the mine, with the exception of coal used in mining operations and by the workmen of the mine. Copper, 4 cents upon every unit, i.e., upon every one per cent of copper contained in each ton of copper ore sold or smelted. Lead, 2 cents upon every unit, i.e., upon every one per cent of lead contained in each ton of lead ore sold or smelted. Zinc, 2 cents upon every unit. Iron, 5 cents on every tone of ore sold or smelted. Other minerals, five per cent on their values.

The operation of mines of coal, shale, ironstone and fireclay is governed by the Coal Mine Regulation Act, Chapter 1, Acts of 1927. Operation of other mines and quarries is governed by the Metalliferous Mines and Quarries Act, Chapter 2, Acts of 1927.

For copy of Mining Regulations and publications, application should be made to the Department of Mines, Halifax.

PRINCE EDWARD ISLAND

Up to the present time this small, but rich, agricultural province has had no mineral industries apart from those entering into the building industry. The Geological Survey of Canada classes the formation as "Late Carboniferous"

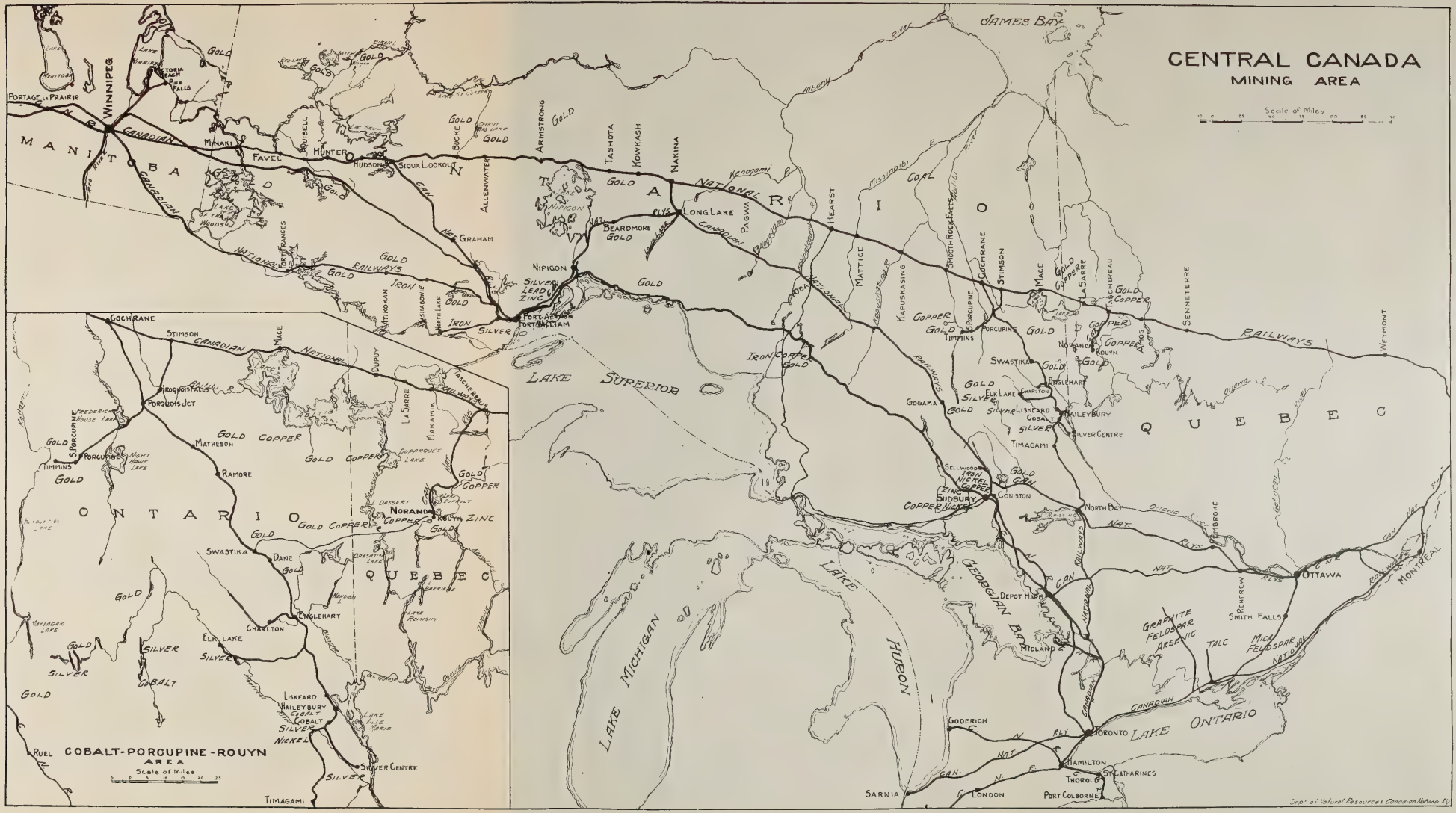
or possibly "Permian". The rocks are principally red sandstone and red clay shale. Clay deposits are found widely distributed; that at Richmond is regarded as one of the best red burning clays in Canada, and from it brick and tile are manufactured. As pointed out by the Prince Edward Island Development Commission, in a report made in 1917, this clay is particularly suited for the making of what is known, commercially, as "art pottery", a dull, rich, red pottery that would command a high price and be widely marketed. Red sandstone has been quarried for building purposes but its durability appears doubtful and most of the building stone is imported.

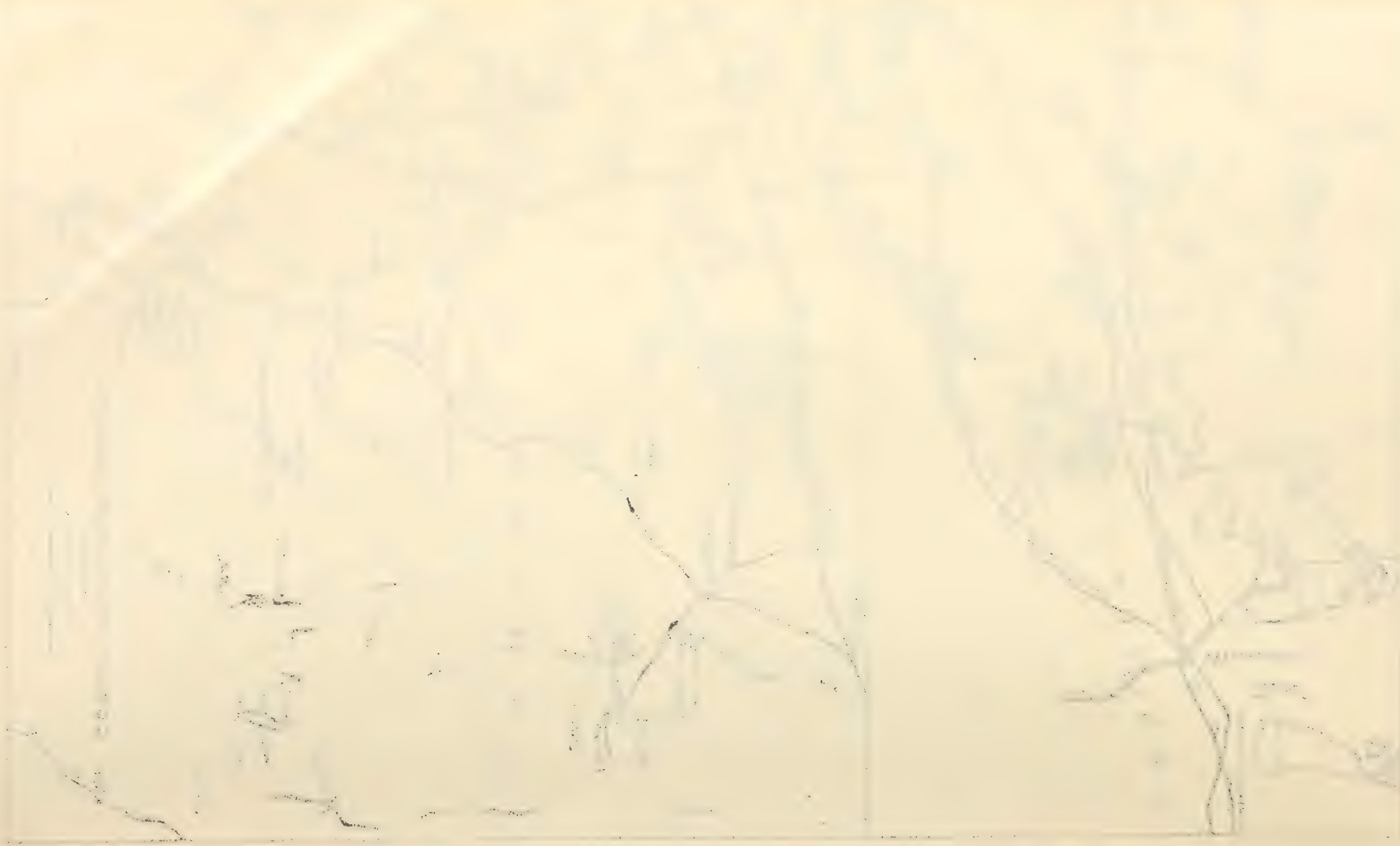
It is probable that coal seams underlie a portion of the Island, but the indications are that they probably lie at a depth too great for profitable mining. The possibility of finding oil has been given consideration on account of shale formation and topography. Boring concessions have been granted by the

Prince Edward Island Car Ferry

Government to companies organized for that purpose; up to the present time oil has not been found. The dredging of mussel mud for fertilizer might be considered as within the category of a mineral industry. This mud is found in pit beds in bays and river mouths and consists of the accumulation of great quantities of decayed shells of oysters, mussels, and other marine mollusks, imbedded in a dense deposit of estuarine silt.

Prince Edward Island is served by the Canadian National Railways; communication between the Island and the mainland is maintained by the operation of a splendidly equipped car ferry between Cape Tormentine and Port Borden.


CENTRAL CANADA
MINING AREA
Scale of Miles
JAMES BAY
MANITOBA
ONTARIO
QUEBEC
WINNIPEG
PORTAGE la PRAIRIE
CANADIAN NATIONAL RAILWAYS
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
GEORGIAN BAY
LAKE ONTARIO
NIPIGON
PORT ARTHUR
FORT WILLIAM
LONG LAKE
BEARDMORE
GRAHAM
MINAKI
FAVEL
HUDSON
SIOUX LOOKOUT
ARMSTRONG
TASHOTA
KOWKASH
NAKINA
HEARST
MATTICE
KAPUSKASING
COCHRANE
TIMMINS
PORCUPINE
SWASTIKA
GOGAMA
ELK LAKE
CHARLTON
ENGLEHART
LISKEARD
HAILEYBURY
COBALT
SILVER CENTRE
TIMAGAMI
SUDBURY
CONISTON
NORTH BAY
COCHRANE
STIMSON
MACE
DUPUY
LA SARRE
ROUYN
NORANDA
MATHESON
RAMORE
DANE
SWASTIKA
TIMMINS
PORCUPINE
DEPOT HARBOR
MIDLAND
GODERICH
SARNIA
LONDON
TORONTO
HAMILTON
ST. CATHARINES
THOROLD
PORT COLBORNE
OTTAWA
RENFREW
SMITH FALLS
MONTREAL
GRAPHITE
FELDSPAR
ARSENIC
TALC
MICA
COBALT-PORCUPINE-ROUYN AREA
Scale of Miles
RUEL
TIMAGAMI
SILVER CENTRE



METALS

ALUMINUM

Aluminum is a white metal, having an atomic weight of 26.97. It is the lightest of the common metals, and has a specific gravity of 2.58 in the pure condition. It is malleable, can be forged and rolled, drawn into tubes and fine wire, stamped, pressed and beaten. The chief aluminum minerals are bauxite, corundum, alumina, hydrargillite and diaspore (hydrated oxides), cryolite (a fluoride of aluminum and sodium), alum, alunogen, and alunite (sulphates), and numerous silicates including the feldspars and clays. Cryolite is found in commercial quantities only in South Greenland, where it is mined at Ivigtut, on the Araukfjord. This mineral was formerly the only ore of aluminum and it is still used as a flux in the extraction of the metal. It is also used in enamelling iron-ware and in the manufacture of Portland cement. Facts ascertained relating to the occurrence of aluminum, show that it is third in the list of elements of the body of the earth (7.9 per cent according to F. W. Clarke) and first of all the metals — iron comes next with 4.43 per cent.

Bauxite, the commercial ore of aluminum, named after Les Beaux, a district in France where the first deposits were discovered, has not so far been found in Canada. In the United States, this ore, a more or less impure hydrous oxide of aluminum, is found in Arkansas, Georgia, Alabama and Tennessee. The Aluminum Company of Canada, a subsidiary of the Aluminum Company of America, which has for many years been operating a plant at Shawinigan, using imported ores, has established the largest aluminum plant in the world— the Arvida Works in the Saguenay district near Chicoutimi; thus, this industry assumes a new light in Canadian eyes. The operation of the new plant involves the development of "Chute à Caron" on the Saguenay river, the power from which is estimated at 800,000 H.P. The bauxite for this operation is being brought from British Guiana from deposits situated on the Demerara River, sixty miles above Georgetown.

The British Government takes a strong stand with regard to the exploitation of deposits in British Guiana and has ruled that the first call shall be reserved for the British Empire. In December, 1917, it was announced that no further applications for bauxite lands would be granted till after the war. The Government also ordered that a portion of the bauxite mined by holders licensed before this regulation came into force must be placed at its disposal at a certain price and, also, reserved the right to limit or to prohibit the export to countries other than British.

Aluminum has a very wide range of use; its main applications are in the automotive industry and in domestic cooking utensiles. It is taking the place of copper in various channels of trade; an example of this is its increased use in electric transmission lines, more particularly where it is necessary to lighten the physical load on line supports and where the span between supports is of unusual length. Aluminum bronze has much the appearance of gold and is composed of 90% aluminum and 10% copper; it is tough and elastic and is very little affected by atmospheric action. It has been successfully used in the making of bearings. An alloy produced in recent years, composed of 90% aluminum,

2% magnesium, small percentages of copper and zinc, is known as duralimin; its tensile strength is greater than aluminum, is very light, resists corrosion better than aluminum, copper or zinc, is used for aeroplanes, airships and, in England, omnibus bodies have been made from it. Aluminum powder makes a pigment used for painting iron to prevent corrosion. The powder is the active basis of thermite, used in welding and used successfully by Prof. Howard T. Barnes in breaking up ice jams and dispersing icebergs.

ANTIMONY

Stibnite is the most important ore of antimony. This metal has a bluish-white colour and is highly crystalline and brittle. The surface presents star or fern-like markings. The principle use of antimony is in hardening alloys of lead and tin and as antimony white, a pigment of remarkable covering power It is used largely in the making of type metal, anti-friction bearings, Britannia metal, also in glass-making, vulcanizing rubber, fire preventatives, wood preservatives and has a number of other minor uses. China produces over 75 per cent of the world's consumption at the present time.

There is a process for the recovery of antimony oxide, salts and sulphides, direct from stibnite, by treatment of the powdered ore with a solution of caustic soda in water, to which common salt has been added, and passing chlorine gas into the solution of mixed antimony sulphides and sodium antimony sulphides. The different sulphides to be precipitated by suitable reagents, according to the colour of the precipitate required, or, if an antimony white is required, by milk of lime.

Maritime Provinces:

Ores of antimony are found in Nova Scotia and New Brunswick. These mainly consist of stibnite, or sulphide of antimony. Amongst the properties that have been operated are the mines at West Gore in Hants County, N.S., and at Lake George, York County, N.B. The latter has been a source of production since 1863.

Quebec:

Deposits are known to occur at South Ham, Wolfe County, Quebec, but there is no record of these having been worked on a commercial basis.

Manitoba:

So far no deposits of economic importance have been discovered. Stibnite, sulphide of antimony, R. C. Wallace reports, is found "in the galena-sphalerite replacement deposits on the Little Herb River, also in quartz veins on the east side of Herb Lake." Of possible economic interest, however, are the solid stibnite veins which are found in sericitic schist at the west end of Oxford Lake, associated with quartz and large crystals of calcite.

Bib.—GSC Summary Reports 1908 and 1915; GSC "Geology and Economic Minerals of Canada", #2065; GSC Annual Report (Section of Mines) Mineral Industries of Canada for 1905, #971; GSC "Geological Reconnaissance of portion of Algoma & Thunder Bay Districts, Ont.". #980; GSC "Preliminary Report on Gowganda Mining Division Dist of Nipissing, Ont." #1075.

ARSENIC

Arsenic is usually found in the following ores: auriferous mispickel, arsenopyrite, smaltite, nicollite, also as a constituent in other gold, copper and silver ores.

This product is used in the glass-making and tanning industries, dyeing trade, for preserving furs and other uses, including the destruction of rank vegetation. It is one of the most important insecticides, and in recent years has come into active demand for the treatment of boll weevil in the cotton crop of the United States. In the chemical industry it enters into the manufacture of arsenates of lead, soda and lime. It is also marketed as metallic arsenic. It is destined to play an important part in agriculture, as while it is not in itself a fertilizer, experiments have shown that, used in small quantities to sterilize soils and kill enemies of plant life, it promotes growth.

Nova Scotia:

In the Cheticamp district, Inverness County, Cape Breton, mispickel occurs, reported to carry gold from $4 to $10 a ton; at the Montague mines where the gold ores carry arsenic values; at Cochran Hill, Goldenville and in a number of other areas.

Ontario:

Auriferous mispickel ores are found in Hastings County and other parts of Ontario, one of the largest known bodies being near Actinolite. With the exception of the operation at Deloro, these deposits have never been worked to any extent. At Deloro, for a number of years, these ores were at first mined for their gold content, but eventually the gold became a by-product, and as high as two thousand tons a year of white arsenic was produced. Eventually the operation was abandoned, the mill becoming a portion of the present reduction works. In the township of Parkin, near Wanapitei Lake, a deposit of auriferous mispickel has been exposed. Deposits are also found at Net Lake near Temagami in Davis township, Nipissing district, and in the Rainy River district.

The present production of white arsenic is mainly derived from the ores of the Cobalt district, the arsenic being recovered in the refining works at Deloro.

Manitoba:

Mispickel is widely distributed in association with gold quartz veins in the Herb Lake district. It is also found in the Star Lake, Falcon Lake area in Eastern Manitoba.

British Columbia:

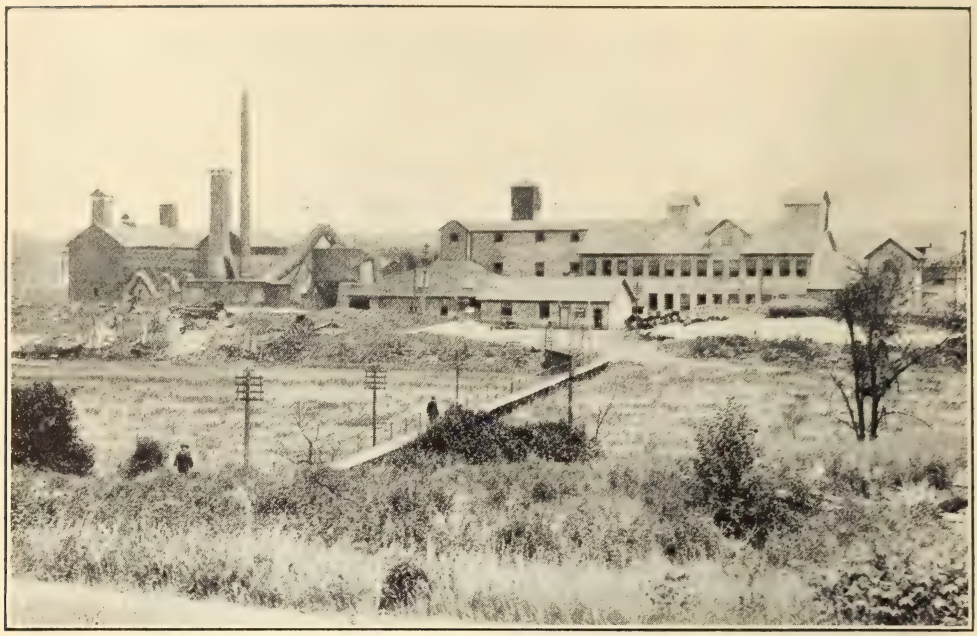
Arsenic is found, associated with a number of ores, in British Columbia, but in very few cases have these values been recovered. At the New Hazelton-Gold-Cobalt mine the gold ores carry arsenic. When the price of arsenic was high it was found profitable to pack out the ore on horses, but under average conditions it has not been found practical.

Bib.—GSC Memo. 119, 1922, "The Reed-Wekusko Map-area, Northern Manitoba"; GSC "Geology and Economic Minerals of Canada", #2065; GSC Summary Reports; 1905, Cobalt Silver District; 1909 Cumberland County, N.S. Reports Ont. Dept. of Mines.

COBALT

Ontario:

The principal source of this metal is from the ores of the famous silver camp, which was named Cobalt, as a result of the presence of this metal. It is found to occur in silver, nickel and copper ores, chiefly in the minerals cobaltite and smaltite.



Deloro Smelting & Refining Co's Plant

Silver Shipment, Deloro, Ont.

The silver-cobalt-nickel ores of Cobalt camp are mined primarily for their silver content—the cobalt being a by-product. The cobalt in the main is recovered in the form of cobalt oxide at the reduction works at Deloro. Canada supplies practically half the world's market in this commodity.

As this metal and nickel are almost atomic affinities, it is necessary to put them in solution to effect a ready separation by precipitation. The cobalt oxide so recovered can be converted into metallic form. Cobalt oxide amongst other commercial uses is a very valuable pigment, and produces a remarkable blue, used in staining glass, and in the colouring of ceramics. This metal is an important constituent in certain stainless steels, also an element in various alloys, amongst which might be mentioned that, known commercially as stellite, which earned a reputation during the Great War, high speed cutting tools being composed of it. It is also made into surgical and dental instruments.

Cobalt is also found as a constituent of the Sudbury nickel-copper deposits. Small quantities of cobalt, nickel and silver-bearing minerals occur on Michipicoten Island, Lake Superior, and arsenical compounds of cobalt and nickel have been found in several other localities in Ontario and at Calumet Island, Quebec. Cobalt bloom is reported by the Ontario Bureau of Mines as occurring sparingly in some of the magnetite deposits near Madoc in Eastern Ontario.

British Columbia:

The arsenical-gold-cobalt deposits at Rocher DeBoule Mountain in the vicinity of Hazelton are attracting attention on account of the unusual association of these and other minerals found in moderate sized veins in this area.

Bib.—GSC Summary Report 1922, Part "C", Rice Lake Map-area, Southeastern Manitoba; Ont. Dept. Mines Report 1910, Vol. XIX, Part II, The Cobalt-Nickel Arsenides and Silver Deposits of Temiskaming; Ont. Dept. Mines' Reports 1904 to date. Also the reports of the Ontario Dept. of Mines.

COPPER

As pointed out by the Department of Mines, copper ores of various kinds, including native copper, copper carbonates, oxides and sulphides, occur at many places throughout Canada. The sulphide ores, chalcopyrite and bornite, are, however, of present commercial importance. Production has so far been confined to the following provinces in the order of their importance: British Columbia; Ontario; Quebec; Manitoba; and Yukon Territory, though deposits of copper minerals are also known in the Maritime Provinces and in the Arctic regions of Northern Canada.

One of the main uses of copper is in the electrical manufacturing industry, largely in the form of wire used in connection with electrical power, lighting and communication, also in electrical refrigeration. The automotive industry is one of the largest consumers, more particularly in the form of brass, bronze and other alloys, though aluminum is displacing it to some extent. Other uses include roofing, plumbing supplies, washing machines and lightning rods.

Maritime Provinces:

Copper is found on both sides of the Bay of Fundy, but any production has been small and irregular. Shipments were made at one time from a property at Scotch Settlement, located in King's County, N.B. Another property which has attracted some attention is at Elgin Corner, N.B.

In a report of the Geological Survey of Albert County, a statement is made that a number of these deposits along the southeast of the Province were opened up years ago and large sums of money spent in order to secure profitable returns, but none of them proved remunerative, largely due to the limited character of the operations and primitive practice. In most of the occurrences the ore is a pyrite or pyrrhotite, occurring with quartz and a small quantity of calcite in irregular bunches. While excellent samples were obtained at a number of of places, so far it has been difficult to locate any well-defined body of ore. It can be said, however, that little prospecting of a scientific character has been done in the Maritime Provinces and it is also true, as in the case of Ontario, that with improved methods of recovery the costs of refining and smelting have been greatly reduced and copper mining may yet prove profitable in this part of Canada.

Quebec:

The presence of copper in the Province of Quebec is first referred to by Sir William E. Logan in the Geological Survey of 1847-48. Following this, from 1895 to 1866 the Eastern Townships experienced a mining boom which resulted in a wide search for copper, during which hundreds of prospecting shafts were sunk and a considerable quantity of copper ore extracted. These operations were on a small scale and eventually proved unprofitable. A few mines, however, have been successfully operated and there is now every prospect of a revival of the industry under modern mining and metallurgical practice.

It is of interest to note that Logan's conclusion was that "it can hardly be doubted that when the copper deposits of Eastern Canada are thoroughly explored and proper means of working them and of smelting their ores are adopted, they will become a source of great wealth, and furnish employment for a large population."

According to Bancroft, the majority of the copper deposits of the Eastern Townships are associated with more or less highly altered igneous rocks. There are three main occurrences designated by Dresser as the "Sutton Belt," the "Ascot" or "Stoke Mountain Belt" and the "Lake Megantic" or "Boundary Belt." The Sutton Belt extends to the northeast through the townships of St. Armand, Sutton, Brome, Shefford, Stukeley, Ely, Melbourne, Cleveland, Shipton, Tingwick, Arthabaska, Chester, Ham, Wolfestown, Inverness and Leeds, as well as the division of the seigniory of St. Giles, known as the Handkerchief, and Ste. Marguerite, in the county of Lotbiniere. The Ascot or Stoke Mountain Belt similarly extends through the townships of Hatley, Ascot, Stoke, Dudswell, Weedon and Stratford to Lake St. Francis. Concerning the third belt which lies along the boundary line between Quebec and the State of Maine, to the south and east of Lake Megantic, very little is known.

By far the majority of the known occurrences of copper minerals in the Eastern Townships lie within the Sutton and Ascot Belts. Some, however, are distributed within that area which lies to the west of the Sutton Belt and to the east of the Champlain fault. Others are distributed within the area between the Sutton and Ascot Belts.

The Eustis mine, situated seven miles from Sherbrooke, mining copper and sulphur ore, has been operated almost continuously since 1865. After shutting

Horne Mine in 1924

Horne Mine in 1925

down for a short period it was re-opened in 1924, when there was a change of practice. Under the new method the ore is separated into copper concentrates containing from 20 to 22 per cent metallic copper and a pyrite concentrate of 50 per cent sulphur. Work has also been resumed by the Canadian-American Copper Refining Company on what were formerly known as the "Ives" and "Bolton" mines, where it is proposed to erect a reduction works.

In the Gaspe Peninsula there are copper deposits which show every evidence of being of commercial value. Recently, some discoveries have been made which would appear of major importance. The development of the York River copper claims in the Peninsula, has been retarded by lack of transportation. They are situated ten miles from the terminal of the Canada and Gulf Terminal Railway.

Horne Smelter, Rouyn, Que., 1927

Rouyn.—The genesis of Northwestern Quebec copper-gold mining may be said to date from the discovery of gold at Lac Fortune by Oliver Renaud, in 1906, and in 1911 the discovery made on Lac DeMontigny. Following the marked success of Porcupine and Kirkland Lake, the stage was all set for a rush into Quebec. The report that a prospector, named Ed. E. Horne, had discovered a rich deposit of chalcopyrite carrying gold was all that was necessary to bring it about. An index to the extent interest has gathered way, will be found in the fact that in 1926 3315 miners' certificates were issued as compared with 493 in 1921. While discoveries were made in Rouyn and surrounding areas in 1923, no great activity occurred until 1925, since when phenomenal progress has been made in this field—copper and gold discoveries of major importance being made, and zinc in the form of sphalerite.


PART OF
NORTHWESTERN QUEBEC
COPPER-GOLD AREAS
Scale - Miles
0 1 2 3 4 5 10 15
DESMELOIZES
CLERMONT
CHAZEL
DESBOUES
MONIAC
COIGNY
LA REINE
LA SARRE
ROYAL-ROUSSILLON
LANGUEDOC
GUYENNE
BERRY
BEARN
CASTAGNIER
LAC ABITIBI
ROQUEMAURE
PALMAROLLE
POULARIE
PRIVAT
LAUNAY
TRECESSON
DALQUIER
DUVERNY
HEBECOURT
DUPARQUET
DESTOR
AIGUEBELLE
MANNEVILLE
VILLEMONTEL
FIGUERY
LANDRIENNE
MONTBRAY
DURRAT
DUFFESNOY
CLERICY
LA PAUSE
PRENTISC
LA MOTTE
LA CORNE
DASSERAT
BEAUCHASTEL
ROUYN
JOANNES
BOUSQUET
CADILLAC
MALARTIC
VARSIAN
DUFAY
MONTBEILLARD
BELLECOMBE
VAUDRAY
MONTANIER
SURIMAU
FOURNIERE
DUBUISSON
Dept of Natural Resources
Canadian National Railways

It was first supposed that the mineralization was mainly confined to a belt of Timiskaming sediments some six miles in width and extending from the Ontario boundary to the Bell River—an eastern extension of the Kirkland-Larder Lake belt—also to a belt north of this, a continuation of the Porcupine-Lightning River areas. It is now, however, apparent that the mineralized area comprises over ten thousand square miles, in which occur large areas of Keewatin rocks—a formation favourable to mineralization. A feature of significance is that most of the important discoveries have been made in the vicinity of the granite intrusions. The most outstanding copper-gold-zinc discoveries have been made on the Horne property of the Noranda Mines Limited, the Waite-Montgomery, located on the line between Duprat and Dufresnoy Townships; the Alderson-Mackay, and the Amulet. Amongst other properties of promise are the Arntfield; the Chance Syndicate; the Macdougall; Cassell's; Nipissing; Coniagas; Consolidated Smelters; the Osisko group, and the Harvie Mines, which have a large area upon which development is proceeding contiguous to a granite intrustion near the Kinojevis River.

Other development companies occupying favourable ground and carrying on exploratory work are Duprat Mines, Don Rouyn, Stadacona, Area Mine, Fiske Gold Mines, Victoria Syndicate, Gold Pan, Goodwin, Grover-Daly and Powell, also the Abana, situated north of the Canadian National Railways in Desmeloizes Township. It is impossible to mention all the groups that are operating in the area and the foregoing are only given to indicate the great activity that is proceeding in the district.

A customs smelter has been erected by the Noranda Mines Limited, with a projected capacity of 4000 tons—the initial installation having a capacity of one thousand tons a day—and it appears highly probable that it will only be a short time before other units will have to be added to meet the needs of this district. A railway spur has been built into the property as well as several miles of railway line built by the mining company itself, to serve all phases of the operations. The company has a contract for power with the Northern Canada Power Company. A well-laid out town with good public utilities adjoins the Horne property.

As pointed out elsewhere, the Canadian National Railways operate a branch line from Taschereau to Noranda (Rouyn), 44.4 miles in length, with spur lines projected and under construction to the various properties and, as in the case of Cobalt and Porcupine, passengers can now travel to their destination in palatial sleeping-cars.

Chibougamau.—This area has attracted much attention in recent years. In 1926 a large number of prospectors visited the area and many claims were staked. The country was staked for six miles in each direction along the strike of the MacKenzie copper discoveries. Assays of some of the samples showed high values but sufficient work has not been performed to determine the size of ore bodies, but they are apparently large. The values were in gold, copper, and silver. The area can be reached by canoe route from Oskelaneo; however, the route from Manouan Station is considered preferable for canoes with outboard motors.

Ontario:

The discovery of copper in Rouyn has started a widespread search for copper in Ontario and Quebec; thousands of claims have been staked and the search continues throughout an area of not less than 1,000 square miles. Copper was first discovered in the Sudbury district in 1882 during the railway construction, about three miles north-west of Sudbury Junction, since known as the Murray mine, followed by the finding of the Stobie and Copper Cliff mines. Due to the value of the nickel content, copper became eventually a by-product and from the old Canadian Copper Company emerged the International Nickel Company. Recent developments at the Frood Mine seem to indicate high copper values in the large ore bodies developed. These deposits are dealt with under the heading of NICKEL.

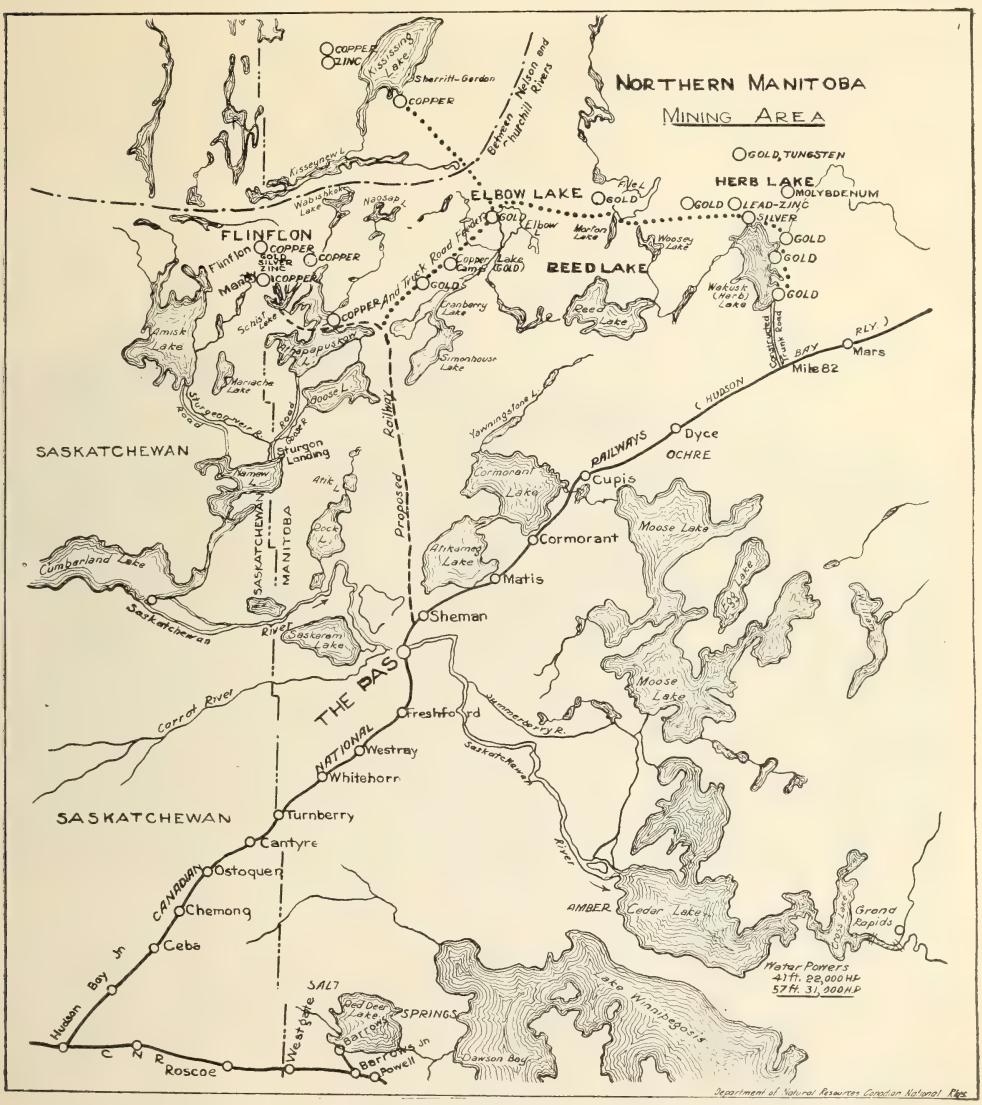
It has been pointed out that there are two main reasons why the development of copper in Ontario has been more or less neglected. In the first place, most of the deposits found were of too low-grade to be profitable when treated under the metallurgical processes and conditions prevailing at that time; further, in most cases, transportation was lacking. The cost of refining and smelting has been greatly reduced with the result that properties formerly valueless are now being eagerly sought and many old claims re-staked. Copper-gold stakings in the Sudbury, Larder Lake, Temiskaming and Porcupine Mining Divisions in 1926-27 are said to number over 5,000 claims. In other parts of Ontario, such as the North Hastings district, chalcopyrite occurs in association with pyrites deposits. In the Parry Sound district, rich pockets of bornite and chalcopyrite have been found. Copper has also been mined in the Rainy River district, shipments having been made from Mine Centre, Olive and Kashabowie. North of Shebandowan Lake, in the vicinity of Round Lake, are evidences of chalcopyrite well worth investigation.

Manitoba:

Investigation and development carried on in recent years indicates that Manitoba contains a wide range of minerals. Perhaps the most important commercial feature of the development has been the opening up of the largest bodies of copper ore yet found in Canada, the copper-zinc sulphides at Flin Flon and Schist Lake, 80 miles north-west of The Pas, on the boundary line between Manitoba and Saskatchewan. Diamond drilling at the Flin Flon to 900 feet has blocked out a body of ore variously estimated at sixteen to twenty million tons. This property is owned by the Mining Corporation of Canada who have granted an option to a New York group. After carrying on exhaustive tests on the ore and erecting a pilot plant for further tests, plans were laid for the building of a 4,000-ton smelter. The development of the property will involve an expenditure of approximately $20,000,000 and includes hydro-electric development on the Churchill River. A railway charter has been granted and a line will be built from a point on the Hudson's Bay Railway into the property.

The discovery of copper-zinc ores on the Sherritt, east of Lake Kississing (Cold Lake), 40 miles east of the Flin Flon, and the Moody claims five miles east of the Sherritt indicate that other copper properties will be discovered when the district is more thoroughly prospected. It will be remembered that the Mandy mine, in the vicinity of the Flin Flon, shipped 26,000 tons of high-grade

copper ore averaging 18% to the Trail smelter and, while the high-grade is largely exhausted, there is still a large body of lower-grade ore. That this is an inviting field to the prospector cannot be too strongly emphasized and, from present indications, the results should completely change the present point of view of the public on this region which, in addition to possessing valuable mineral resources, is also rich in water-power. On the Nelson, Churchill, Reindeer and Saskatchewan rivers, it is estimated by the Water-powers Branch



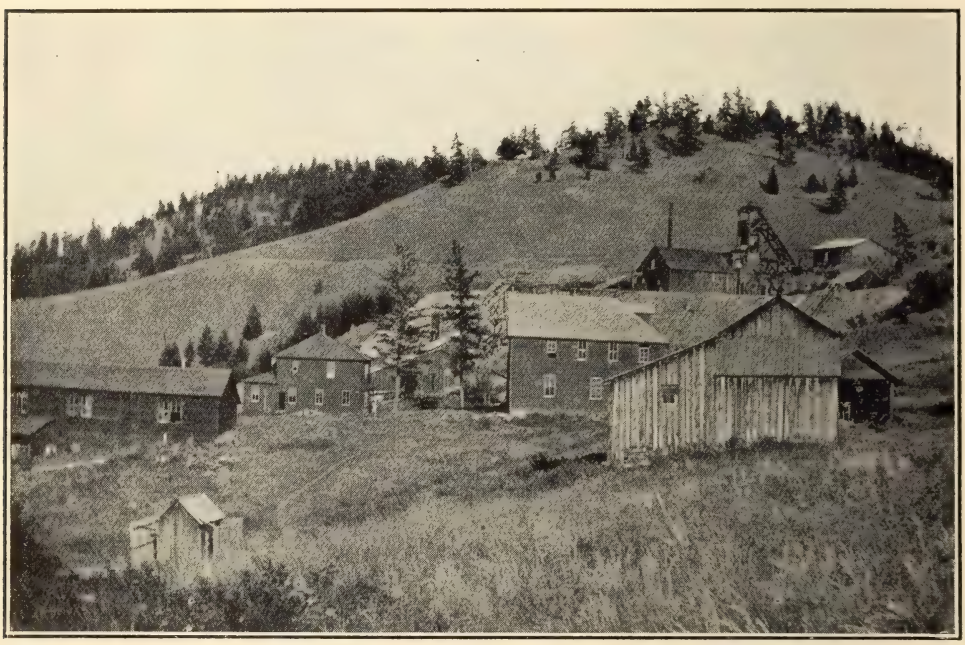
that over three million h.p. can be developed at ordinary minimum flow with 80% efficiency and it is highly probable that, with the regulation of the water, something like five million h.p. turbine energy is possible of development.

The most outstanding mineralized area yet discovered in Northern Manitoba is a belt 125 miles long and 20 to 40 miles wide, extending east and west from Herb Lake, Man., to Amisk Lake, Sask., and crossing the Saskatchewan-

Manitoba boundary just south of latitude 55°. This is known as "The Pas Mineral Belt." The geology which characterizes it—Keewatin (including Huronian) formations between the limestone and Laurentian granites is carried much farther and has been traced in a general way east as far as God's Lake, Hayes river and west to Lac La Rouge, Churchill river. This formation is similar to the mineralized portions of Northern Ontario.

British Columbia:

In British Columbia, the chief copper-producing province of the Dominion, copper-bearing minerals, chiefly chalcopyrite and bornite, are found in many localities either alone or, more often, associated with pyrite, pyrrhotite, magnetite, sphalerite, galena, mispickel or other minerals. The most important discoveries yet developed are in the Coast district and in the southern interior parts of the Province.

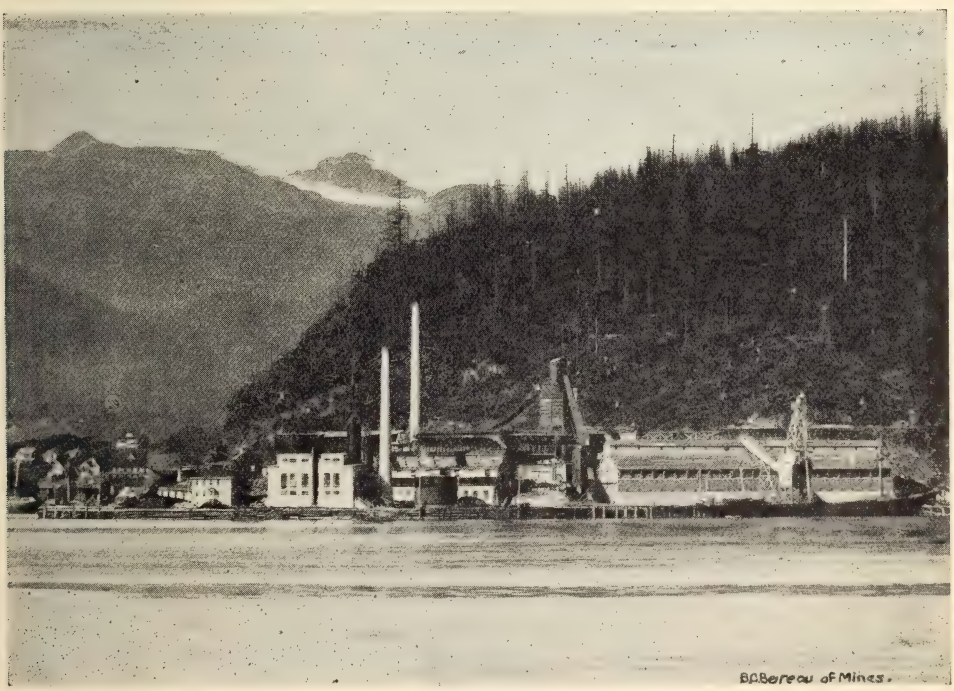


Kamloops Copper Co. "Iron Mask", South of Kamloops, B. C.

The first discovery of mineral deposits within the boundaries of the batholithic rocks was the occurrence of the Britannia mineral belt about thirty miles from Vancouver City in 1898. Since then, W. M. Brewer points out, each year more and more attention has been devoted by prospectors and mining men generally to the mineral possibilities of the Coast Range, with the result that deposits of ore of commercial grade have been discovered at various other points such as near the shore line at Howe Sound, Phillips and Frederick Arm, the shores of Thurlow Island, Knight's Inlet and Seymour Inlet, all of which localities offer remarkably good opportunities for prospectors to carry on their work. One reason for this is that all of the inlets mentioned are within the boundaries of sheltered waters, so that small launches, rowboats, and canoes can be used in prospecting the shore line.

In the southern area contiguous to the line of the Canadian National Railways there are copper deposits near Ashcroft and some of promise at Kamloops. Between Tete Jaune Cache and Prince George and in the vicinity of the Fraser River are mineralized areas with some showings of copper in the somewhat complex ores, but insufficient work has been done upon them to determine their commercial value. Along the Skeena River, near Terrace, Usk and Vanarsdol there are a number of properties of promise; Legate Creek, Chimdemash Creek and Kleanza Creek have all been the scene of active prospecting work, in most cases the copper being associated with other values. On the latter, some 13½ miles from Usk, is the Lucky Jim mine, where there is a showing of disseminated bornite, chalcopyrite, and copper carbonate occurring in a zone five to ten feet wide, which also carries values in gold and silver. Amongst other deposits at Usk is the Lucky Luke, on which development work of an encouraging character has been carried on from time to time. In the Hazelton section, some work has been done on copper-gold deposits on Rocher DeBoule and Nine Mile Mountains.

The Britannia Mining and Smelting Company is controlled by the Howe Sound Company of New York. This mine is one of the three most important copper producers in the British Empire. The Company owns 546 mineral claims, having a total area of 25,393 acres, also timberlands and water-powers. The mine has 50 miles of underground workings. The lowest level from which ore has been extracted is about 2,000 feet below the summit, or outcropping



Britannia Copper Mine, Howe Sound, B. C.

of the ore body, and about the same height above sea-level. The ore bodies on the Britannia mine are classified as chalcopyrite deposits in schists. The formation has a strike in a northwesterly direction, with a dip of 70° to the south and forms a roof pendant in the Coast Range Batholith. The chief minerals of all the deposits are primary sulphides, chalcopyrite and pyrite in a silicified schist or quartz gangue. The Granby Consolidated Mining Smelting and Power Company are operating a large body of copper ore at their Hidden Creek mine on Observatory Inlet. The ore bodies are very large, having an average breadth of 150 feet; the occurrences are characterized by the presence of pyrrhotite, chalcopyrite, sphalerite, pyrite and arseno-pyrite. This, one of several properties owned by the company contains 412 acres. The company's Anyox smelter is said to be the largest pyritic smelting plant in the world.

Bib.—GSC Summary Reports: "Copper Deposits in Gaspe Peninsula" 1923, Part CII; "Dufresnoy Map-area, Temiskaming Co., Que.", 1923, Part CI; "Flin-Flon Map-area, Man. & Sask.", 1922, part "C"; "A Reconnaissance bet. Kitsault River & Skeena River, B.C., 1922, Part "A"; "Upper Kitsault Valley", 1921, Part "A"; "Geology & Min. Res. Rice Lake & Oiseau Rivers Area", 1921, Part "C". GSC "Copper Deposits of the Eastern Townships", #974; GSC, "Portions of Portland Canal & Skeena Min. Div., Skeena Dis., B.C.", Memo. #32; GSC, "The Atlin District, B.C.", Memo. #37; GSC "Geology & Ore deposits of Salmon River Dist., B.C., Memo. #132; GSC "Temiskaming County, Que.", Memo. #103; GSC, "Amisk-Athapapuskow Lake Dist.", #105. Dom. Mines Dept. "Investig. in Ore Dressings & Metallurgy 1923," #617; Ont. Dept. Mines' Reports; B.C. Dept. Mines' Reports. "Oiseau & Maskwa River copper & copper-nickel deposits Southeastern Manitoba (Can. Inst. Min. & Met. Bul. No. 155, March, 1925).

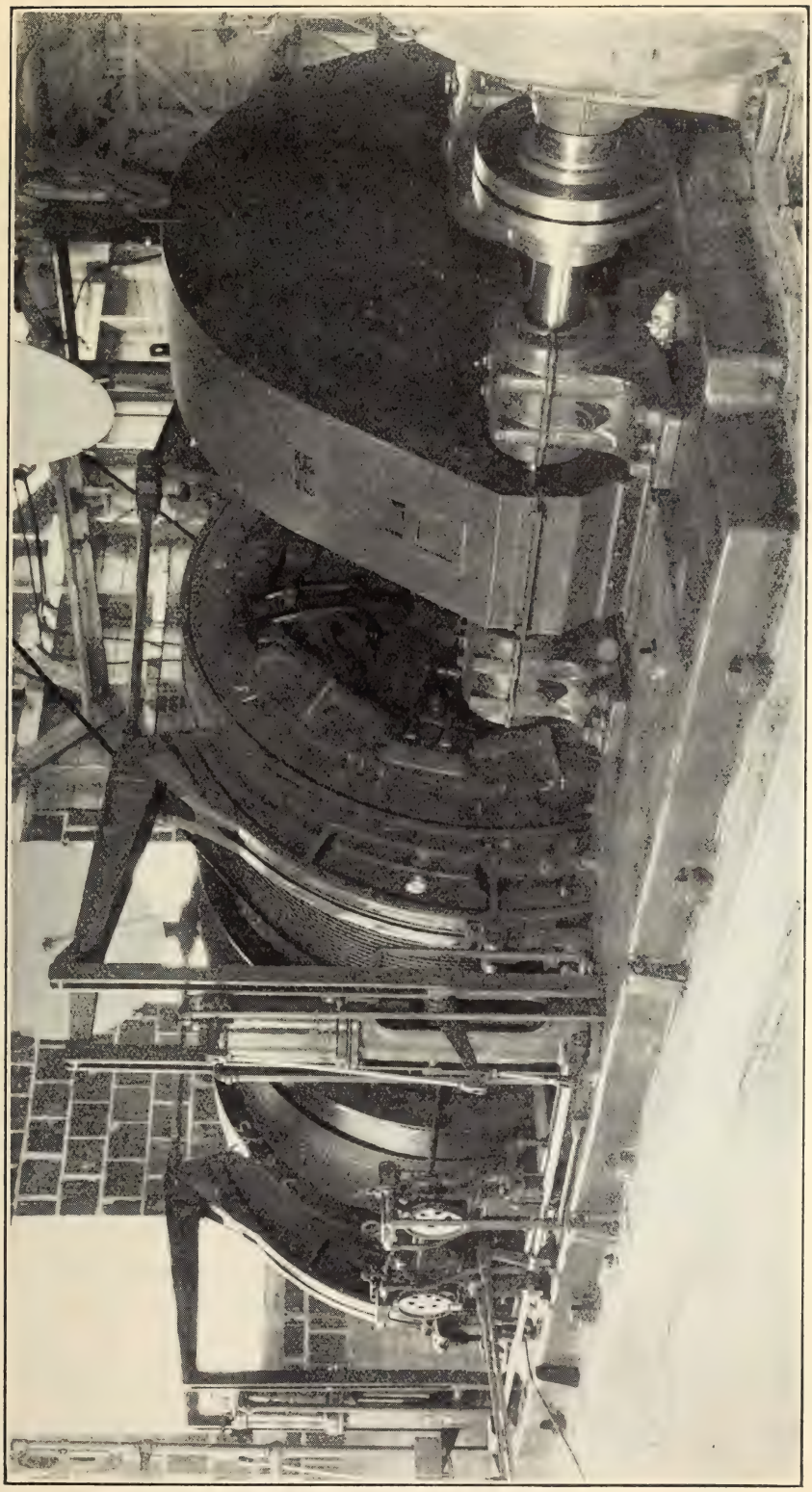
GOLD

Gold-mining in Canada dates back to 1858, when the gold rush to the Fraser River occurred, and in 1866 there was an excitement in Ontario, largely due to the finding of what was later known as the "Richardson pocket" at Eldorado. As early as 1878 miners began to enter the Yukon, but it was not until 1894 that gold was found in Quartz Creek, a tributary which enters the Yukon above the Klondyke River at the mouth of which the city of Dawson now stands. The result of this discovery was the historic rush of 1897-98, probably unparalleled in the history of mining. Gold-mining in Ontario however, can not be said to have been a profitable industry until the discovery of the Porcupine field and adjoining areas, though in the later nineties there was an activity in Western Ontario when the Sultana, Mikado, Golden Star, Foley and others, were operated and later in Southeastern Ontario some production was carried on for a number of years, principally at Cordova and Deloro.

In spite of the increased cost of supplies, material and labour, improved methods of mining, metallurgy, cheap power and transportation facilities make present recoveries higher and costs of production lower than in the earlier days of the industry. It is now possible to work properties that could not have been profitably operated in the past. The result is that examination is being made of a number of the old mines and a resumption of activity is now under way.

Nova Scotia:

The gold-bearing rocks of this province form a belt varying in width from 10 miles at the eastern end to 75 at the western extremity and extending some 275 miles in length along the Atlantic Coast from Canso to Yarmouth—an area of some 6,000 square miles, underlain by what has been termed the "true



Hoist in a Northern Ontario Mine.

GOLD PRODUCTION OF THE WORLD (a)

(In fine ounces)

Country	1917	1918	1919	1920	1921	1922	1923	1924	1925
NORTH AMERICA:									
United States	4,051,440	3,320,784	2,918,628	2,476,166	2,422,006	2,363,075	2,502,632	2,528,900	2,376,514
Canada	738,831	699,681	766,764	765,007	926,329	1,263,364	1,233,341	1,525,382	1,740,386
Mexico	756,878	813,895	758,354	735,078	684,634	748,291	776,808	792,401	755,000
Total North America	**5,547,149**	**4,834,360**	**4,443,746**	**3,976,251**	**4,032,969**	**4,374,730**	**4,512,781**	**4,846,683**	**4,871,900**
Central America and West Indies	**151,026**	**164,475**	**159,638**	**145,125**	**120,937**	**120,937**	**96,750**	**87,075**	**75,000**
SOUTH AMERICA:									
Bolivia	242	242	242	242	290	407	407	964	.....
Chile	37,041	37,007	37,007	43,538	45,139	79,828	105,549	112,011	.....
Brazil	143,093	135,450	96,750	125,775	134,482	146,668	144,675	135,000	.....
Colombia	241,875	290,250	290,251	280,575	290,250	275,737	275,738	266,063	.....
Ecuador	42,947	38,700	38,700	36,281	36,259	42,456	42,456	38,700	.....
Peru	60,667	57,645	65,232	62,757	77,385	81,436	120,372	120,372	.....
Guiana—British	25,107	24,546	16,216	9,675	12,828	10,876	7,262	7,187	.....
Dutch	21,527	18,851	15,932	12,506	11,285	11,992	12,731	10,352	.....
French	69,587	57,741	53,212	43,538	48,375	48,772	44,624	63,496	.....
Venezuela	30,810	22,891	29,025	18,839	30,253	17,361	17,361	17,361	.....
Other countries	707	677	677	4,858	3,967	3,967	3,881	3,882	.....
Total South America	**673,603**	**684,000**	**643,244**	**638,584**	**690,513**	**719,500**	**775,056**	**775,388**	***780,000**
EUROPE:									
Austria-Hungary	7,256	8,708	.....	.....	161	546	739	1,961	.....
Czechoslovakia	.....	.....	6,076	8,761	11,413	8,294	3,344	9,002	.....
France	33,862	24,187	7,298	900	8,906	16,493	16,943	19,804	.....
Roumania	.....	.....	.....	.....	41,409	42,984	48,225	42,149	.....
Russia and Siberia	870,750	580,500	532,115	57,225	43,177	146,700	250,673	573,877	.....
Other countries	760	1,903	1,446	9,148	8,231	9,744	11,351	26,849	.....
Total Europe	**912,628**	**615,298**	**546,935**	**76,034**	**113,297**	**224,761**	**331,275**	**673,642**	***1,000,000**
OCEANIA:									
New South Wales	82,170	87,044	65,839	48,907	51,173	25,222	18,833	18,685	19,422
Queensland	179,302	133,571	121,030	115,230	40,376	80,584	88,726	98,841	44,332
South Australia	7,145	6,189	3,224	1,697	2,660	1,000	950	787	780
Victoria	201,042	158,827	135,428	168,979	104,512	106,872	95,403	67,167	47,296
Western Australia	970,317	876,508	734,066	617,842	553,731	538,245	504,511	485,118	440,818
New Zealand	199,803	208,654	222,063	124,375	135,720	144,117	164,408	129,900	*125,000
Tasmania	14,948	10,529	7,686	6,246	5,340	3,431	3,684	4,625	3,524
Other countries	9,284	9,232	12,508	12,502	9,779	12,260	12,741	12,224	*10,000
Total Oceania	**1,664,011**	**1,490,554**	**1,301,884**	**1,095,778**	**903,291**	**911,731**	**889,256**	**817,347**	**691,172**
ASIA:									
British India	523,069	485,236	507,260	499,068	432,723	438,015	383,697	396,349	392,400
China	174,155	174,150	159,637	125,000	100,000	100,000	89,500	107,300	*100,000
Chosen (Korea)	162,724	159,637	135,450	76,000	130,893	127,892	121,433	120,000	*125,000
British East Indies	39,425	35,556	31,444	29,025	24,188	29,025	29,025	24,187	*24,000
Dutch East Indies	98,622	88,836	92,592	90,920	94,168	104,295	115,547	124,388	*124,500
Formosa	52,303	24,850	20,186	13,500	28,455	21,958	21,598	8,503	*8,500
Japan	226,380	246,998	233,405	248,181	237,106	241,993	247,266	244,340	271,000
Other countries	18,982	20,727	39,810	29,366	30,637	20,924	16,405	22,023	*22,000
Total Asia	**1,295,660**	**1,235,990**	**1,219,784**	**1,111,060**	**1,078,170**	**1,084,102**	**1,024,831**	**1,047,090**	**1,067,400**
AFRICA:									
Belgian Congo	102,734	117,733	108,442	96,804	65,715	68,351	91,306	118,119	109,500
Madagascar	26,742	23,877	22,505	16,686	14,660	18,582	16,686	10,802	*11,000
Rhodesia	834,232	631,358	593,446	553,067	586,908	655,296	649,082	628,974	582,752
British West Africa	368,168	314,860	225,226	230,948	203,606	213,395	200,565	233,910	*235,000
Transvaal, Cape Colony and Natal	9,018,387	8,418,377	8,331,651	8,158,455	8,128,722	7,009,858	9,149,073	9,575,040	9,599,702
Other countries	16,709	26,028	33,476	26,905	44,984	43,587	49,810	38,362	*38,500
Total Africa	**10,366,972**	**9,542,243**	**9,314,746**	**9,082,865**	**9,044,595**	**8,009,069**	**10,156,522**	**10,605,207**	**10,576,454**
Grand Total	**20,611,049**	**18,556,920**	**17,629,977**	**16,125,697**	**15,983,772**	**15,444,830**	**17,786,471**	**18,852,432**	**19,061,926**

(a) 1916-1924, as reported by the Director of the Mint, with some changes; 1925 as compiled by American Bureau of Metal Statistics.

gold-bearing series." This area embraces the counties of Guysboro, Halifax, Colchester, Lunenburg, Queens and Yarmouth. It has produced gold to the extent of over $19 million in value, with an average of approximately $8.70 a ton. For many years,the gold mining industry lay dormant, but it has taken on a new lease of life.

There is no constructive value in analyzing the reasons for its decadence, much space having been devoted to the subject, but it is generally admitted that it was caused by more or less obsolete methods, costly power, lack of knowledge of geological conditions, lack of development of ore reserves and the erection of mills at great expense not warranted by development. There is no doubt that, had the same methods that have characterized gold mining in Ontario been followed in Nova Scotia, a successful mining industry would have been operated. In 1898, that well-known mining engineer, Frank D. Taylor, spoke of the methods in vogue as being utterly impossible, but expressed the opinion that, "nevertheless, Nova Scotia eventually will have a gold mining industry of such economic importance that it will change the whole mental outlook of its people." Everything points towards the fulfilment of this prophecy.

The renewed activity can be said to be largely due to the interest the Nova Scotia Department of Mines is taking in the development and as an outcome of the discerning and painstaking work of E. R. Faribault of the Geological Survey, Sir Stopford Brunton and other competent geologists and mining engineers who have shed much light on the economic conditions and geology of the area. It must not be forgotten, too, that cheap power is now available which will have far-reaching effects on the cost of both mining and milling. Recently, an economic survey has been made by Sir Stopford Brunton, jointly for the Nova Scotia Department of Mines and the Department of Natural Resources of the Canadian National Railways. With this data, it is now possible to lay before mining engineers a fairly intelligent presentation of the case with more or less detail regarding the production of the promising areas, values of ore extracted and milled and the conclusions to be drawn from this information. It is not necessary to go into the geology or phenomena in connection with the deposition of the gold, upon which somewhat divergent theories are held, further than to say that Dr. W. H. Collins, Director of the Geological Survey, points out that "the gold deposits are nearly all situated round, or in relation to, small bosses, dykes and other granitic bodies of subordinate size"—these secondary intrusive granites being the gold carriers.

Nova Scotia provides assurance of ample cheap power, also low working costs, due in part to the character of the ore deposits and the unusual accessibility of the gold fields. It offers sound mining opportunities to those who will seek the facts and judge the country on its merits. The following companies have have been carrying on preliminary operations: Metals Mining and Smelting Corporation of Canada Limited, Goldboro; the Novamac Mines and Power Corporation controlling the Cochran Hill and Goldenville properties and others; Tangier Mine and Power Company, Tangier; Oldham Mining Corporation, Oldham; Malaga Mining Company, Malaga; Bower Mining Company; Kemptville; Leipsigate Company, Leipsigate. A number of other operations are contemplated, and the immediate future will see much activity in the field.

Quebec:

As a result of the work of members of the Geological Survey, it was found that the geological succession of formations of Northwestern Quebec was similar to that in the Kirkland Lake and Porcupine districts in Ontario. It was concluded therefore that there was no apparent reason why similar deposits should not be discovered in Quebec, which greatly stimulated prospecting. In the meantime a discovery had been made by Oliver Renaud at Lac de Montigny, where gold was found to occur in quartz and in pegmatic veins which cut volcanics, sediments and granitic rocks. A rush did not, however, set in until Ed. Horne made the discovery of a rich deposit of chalcopyrite carrying gold, now the Noranda mine. Since that time many important discoveries have been made and large operations put under way which are dealt with under the heading of COPPER.

An index to the remarkable activity in the area may be gathered from the fact that practically all the important Canadian mining corporations are represented in this field and large sums of money have been placed in the treasury of many of the companies for development work, and in the case of more advanced operation, money provided for underground work and the purchase of mining plant.

What this means to the business centres of Quebec can be gleaned from the effect such operations in Northern Ontario have had on the fortunes of that province, where the present purchasing power of the mines is estimated at $65 million annually. Such operations call for large disbursements in equipment, machinery and supplies. Already many firms in the Province of Quebec are receiving orders from the mines in the Rouyn fields.

The alluvial deposits of the Eastern Townships, mainly in the valley of the Chaudiere River, have played an important part, the first recorded discovery being in 1824 on the Gilbert River, a tributary of the Chaudiere. Alluvial gold has been found and worked along the valley of the Chaudiere and some of its tributaries from a point some distance below the mouth of the Gilbert River eastward, almost to the International Boundary.

A small amount of gold also comes from the ores of the Eastern Townships where pyrites and chalcopyrite are found in lenses replacing country rock. These are mined for their copper and sulphur content, and gold is recovered as a by-product.

Ontario:

This Province occupies the premier position as the gold-producing province of Canada. The great bulk of the gold produced comes from the Keewatin and Temiskaming formations, where these are invaded by granite rocks of pre-Huronian age.

Porcupine.—The mines in Porcupine are so well known that they need no description, but it can be said that Hollinger ranks as one of the greatest operating gold mines in the world. Its production is equivalent to double that of the State of California. It has upwards of seventy-five miles of underground railway; it has produced over $114 million up to the end of 1926. The total output

McIntyre Porcupine Mine

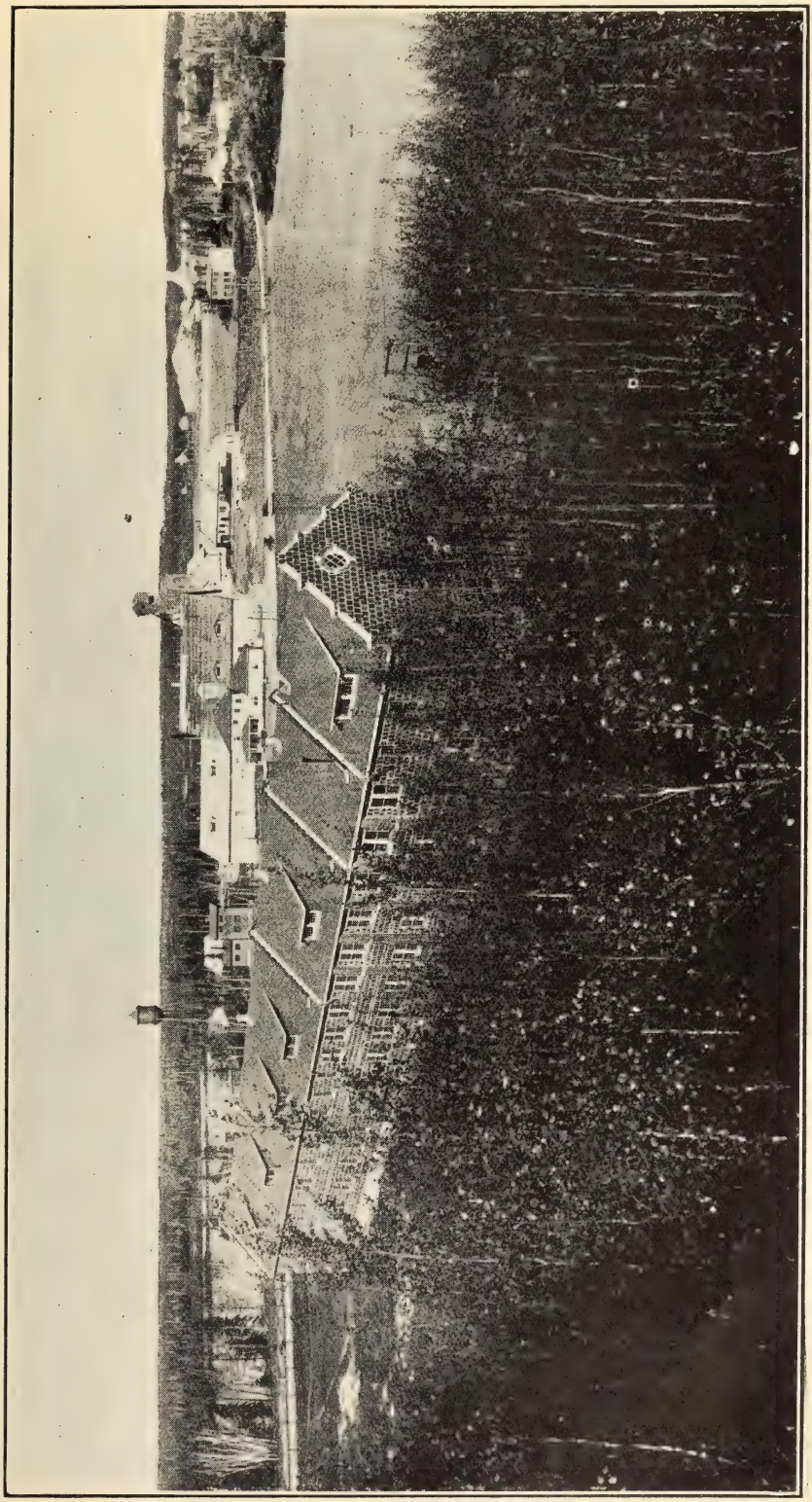
for Porcupine camp 1910 to 1925 was $185 million. The success of the Porcupine field has proved a great incentive resulting in the development of contiguous areas, notably Kirkland Lake, Larder Lake, Swastika and other areas of promise, including the continuation of mineral belts opened up in Western Quebec. Hollinger may attain an 8,000 ton daily capacity during 1927, and McIntyre-Porcupine gives every promise of reaching 3000 tons. The latter have put down a shaft to 4,200 feet, at an approximate cost of $2 million paid out of earnings.

The Dome Mines, a rich producer in the past, had paid up to the end of 1926, over $11 million in dividends. It is carrying on an active search for new ore bodies, and it is considered by competent engineers that there is every likelihood of their locating these in the underlying basalt. The Coniaurum Mines consist of a group of properties lying east of McIntyre, in the township of Tysdale. Over a million and a quarter dollars have been spent on development at the time of writing, and valuable ore bodies discovered. This property, which contains some 640 acres, has already about eight miles of underground workings.

Vipond, controlled by Huronian Belt, is another property of importance; it lies south of, and adjoins the Hollinger. J. Mackintosh Bell, in 1926, told the shareholders that "the outlook of the Vipond may be considered as very satisfactory". Other operating properties in Porcupine camp are West Dome, Lake, Night Hawk Peninsula, Porcupine Gold Fields, and Porcupine Paymaster.

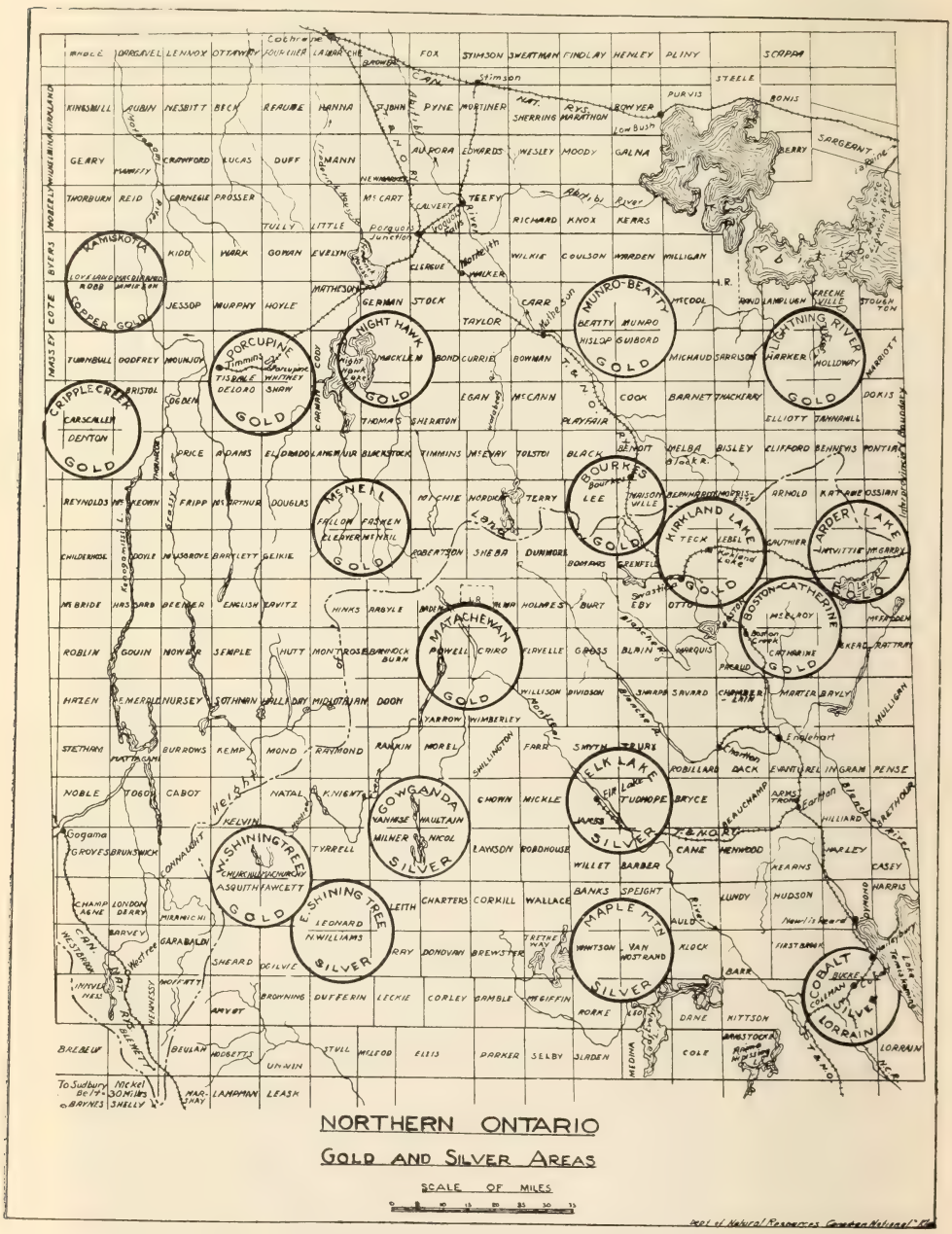
Kirkland Lake Gold Camp.—Situated in the township of Teck, Larder Lake Mining Division. The mines of this camp—perhaps the richest the world has ever known—are producing ore carrying an average value of $16 as compared with an average of $8 for Porcupine district where the large scale operations, however, made it possible to reduce costs well below $5 a ton At Kirkland Lake the indicated average cost is about $6. Such mines, therefore, as the Wright-Hargreaves, Teck-Hughes and Lake Shore, would appear to be in a position to show an average net profit of between $8 and $9 a ton. A few years ago, Kirkland Lake was looked upon as a group of small mines. At the present time, data compiled shows that the net profits of Porcupine camp are only about double that of Kirkland Lake which illustrates how rapidly, in our north country, a gold-mining camp can rise from comparative obscurity to one of world-importance.

Messrs. A. G. Burrows and P. E. Hopkins, in their work on the Kirkland Lake area, describe the mineral zone in part as follows: "The greatest amount of work has been done on the central zone, where a number of gold-bearing veins have been discovered extending over two and a quarter miles in length with a width of half a mile. In this zone operations have shown major fracturing along which the principal properties are located..... The principal or major fracturing can be traced across a number of properties where ore shoots are being developed at widely separated points but evidently along one system of fracturing. This fracturing has crossed all the different rocks in this zone, including feldspar porphyry, syenite, lamprophre, and conglomerate. No. 1 vein at the Kirkland Lake Mine, No. 2 vein of the Orr (now part of the Teck-



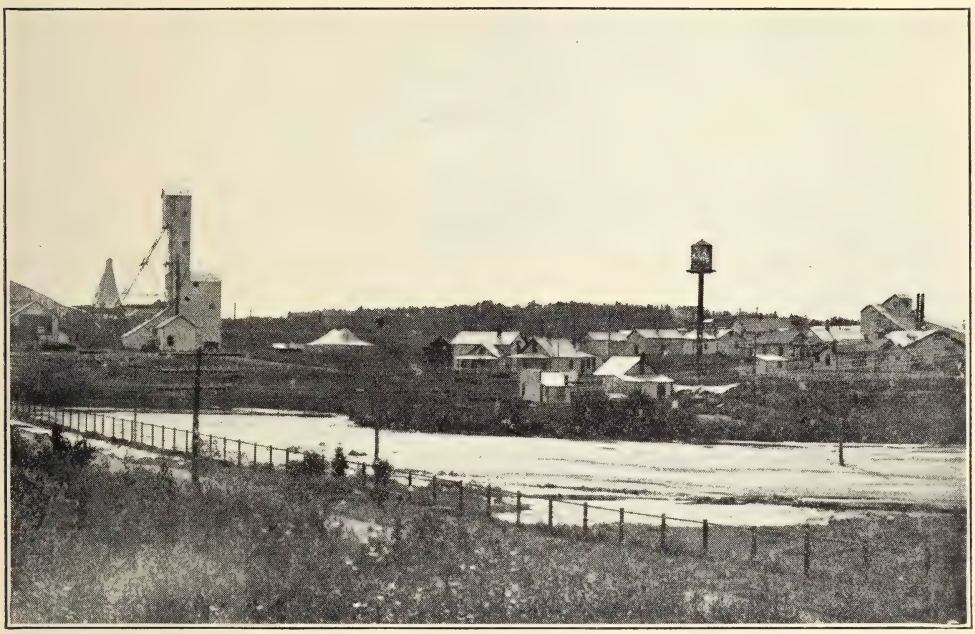
Lake Shore Mine with Wright-Hargreaves in the background.

Hughes), No. 3 vein of the Teck-Hughes, No. 2 vein at the Lake Shore, and No. 2 vein at the Wright-Hargreaves are being developed along the major fracturing. In addition, there are branch veins and other fractures roughly parallel, on which development has been done on a number of properties: examples are No. 1 vein at the Lake Shore, Nos. 1 and 5 at Teck-Hughes, and No. 1 vein at Wright-Hargreaves."



Kirkland Lake Gold Mine.—For a time this mine was not operated at a profit but it now shows a substantial tonnage of rich ore developed mainly on the 1625 to the 2225 foot levels. Great credit is due J. B. Tyrrell, Managing Director, and one of Canada's best known mining geologists, for the results achieved in developing this properties.

Teck-Hughes.—This adjoins Kirkland Lake Gold mine on the east; its new four-compartment central shaft is equipped with electric hoists with a capacity of 1200 tons a day to a depth of 3000 feet, thus anticipating contemplated expansion. The outstanding feature of this property is a rich ore body known as No. 3 vein system which has been proved by diamond drilling to a depth of 2500 ft.; parallel shoots on this occurrence compose a body of ore approximately



Teck Hughes, Kirkland Lake, Ont.

thirty feet in width and extending eight hundred feet in length. The opinion is expressed that this ore body, considering the values it carries and its magnitude, is unique in mining annals. This mine had an average recovery of $18.05 in 1925.

The Lake Shore Mine.—Of this mine, it is officially stated that it has $20 million of proven ore above the thousand foot level. An aggressive programme is being carried out and the capacity of the mill will eventually be brought up from 400 to 1000 tons a day. The remarkably fine bunk-house erected for its men at a cost of something like $200,000, is a big factor in the high standard of efficient labour maintained. This property had an average recovery of $16.07 for the first six months of 1926.

Wright-Hargreaves.—This is another outstanding property. A remarkable vein known as No. 1 has a width of five and one-half feet on the 1000 foot level carrying high values. The company plans numerous improvements in the plant. This mine, for the first six months of 1926, had an average recovery of $14.11.

Tough-Oakes Burnside.—This mine has 343 acres on the east end of the main break now carrying on development with satisfactory results. Sylvanite, lying north of Wright-Hargreaves, has five claims of about 200 acres. This property has a 1500 foot shaft and various levels between the 500 foot and 1500 foot levels. The ore is mainly characterized by altered porphyry and quartz veins. To the east, in Labelle and Gauthier townships, there are a number of properties of promise.

Shining Tree.—Gold was discovered at West Shining Tree in 1911, when the line of the C.N.R. was some sixty miles distant, but progress was retarded by lack of transportation. There is now a good road from Westree, which is from twenty to twenty-five miles from the properties. While values disclosed have been somewhat disappointing, with the advent of cheap power this camp should take on a new lease of life.

Capreol-Foleyet Area.—In Scadding township, southeast of Lake Wahnapitei, the Crystal mine has encouraging possibilities with the advent of transportation and the availability of cheap power. The Gold Nugget, situated near Crerar, to the southeast, is another property of promise upon which development is being carried on. At Makwa Station, seventy-seven miles west of Capreol, some claims have been staked in favourable formation at a point forty chains east of the railway bridge over the Mollie River. The more spectacular showings occur associated with limonite in the joint plains which are well-developed in the rock. There are also some quartz veins. Dr. T. L. Tanton says, in this connection, that field evidence collected at the time leads to the conclusion that the quartz veins are genetically related to a granite intrusion which he mentions and that a rich secondary gold deposit has resulted from the weathering of a primary deposit during past geological ages. The country between Makwa and Missonga offers a particularly attractive field to prospectors. One section is described by a well-known prospector as "a long strip of volcanics flanked by granite with several intrusives and sheared zones with just enough gold to awake expectation." An examination of the geology as shown on the Gogama-Missonga sheet, Map 1697, issued by the Geological Survey, will be found very helpful to prospectors in this area.

Near Tionaga Station, in Penhorwood township, gold occurs in quartz veins, cutting a ferrudinous dolomite and chloritic schist, which merits further attention.

Tashota-Onaman Area.—Further gold discoveries have been made near Tashota, Kowkash and on the south branch of the Onaman River, which have resulted in new interest in this district which lies east of Lake Nipigon and midway between the Lake of the Woods and Porcupine. The larger number of claims lie along the south branch of the Onaman River and are best reached by canoe, from either Tashota or Paska Stations. Temiskaming sediments

found here, as in the Porcupine and Kirkland Lake camps, indicate folding and faulting by Algoman granite. The gold deposits near Tashota and Hull Lake contain more syderite and tourmaline than those along the South Onaman. In reporting on this area, Mr. T. L. Gledhill gives the following hints to prospectors which have a wide application, in light of the knowledge gleaned during the past few years: "as the young pink granite is the gold-bringer, the zone about its borders in the greenstone schists or Temiskaming sediments, is the better place for breaks and mineralization. The area about the smaller masses of granite is more favourable than that about the larger masses. Gold in the Ontario primary deposits of the deep zone is closely related to the end products of granites or syenites. These end products are represented by quartz and feldspar porphyries and quartz veins by hydrothermic action."

Beardmore.—This district is gradually forging to the front as an active mining field. The story is told that during the construction of the then Canadian Northern line, a discovery was made under one of the cook-camps near Beardmore. Being in the Nipigon forest reserve, mining was not permitted, but when the country was thrown open to staking in 1925, the discoverer went in and staked on the old campsite. Surface showings were spectacular and directly it became known it resulted in a rush and the country was staked for about thirty miles along both sides of the line from Jellicoe to beyond Jack Pine. The restrictions with respect to performance of work have somewhat retarded the progress of the camp. One or more of the larger development companies are now showing interest in the area. During 1926 some trenching, stripping, shaft-sinking, and diamond drilling was carried on and attempts to locate commercial ore have been more or less successful and more will be heard of this area. In the vicinity of Jellicoe, King Horn Station and Little Long Lake, values in gold have been shown in quartz veins in the Keewatin, in pillow lavas intruded by an occasional felsite or albite porphyry dyke. Dr. T. L. Tanton, in his report on this area, points out that "the schist-complex extends in a broad belt across the northern part of the mapped area and is crossed by the Canadian National Railways between Octopus and Warneford. At its western end it extends as far south as Parks Lake and to the north beyond the limits of the explored area probably connecting with the schist-complex area in the Kowkash district." He says the schist-complex is favourable prospecting ground for gold, copper, lead and iron, the most promising section being along the railway between Beardmore and Jellicoe.

Lake Savant.—In 1926, a discovery of gold was made at Lake Savant, reached from Bucke Station on the Canadian National Railways, which resulted in a rush and the staking of a number of claims. Insufficient development work has been done to determine the value of the various finds. The original Simmonds discovery is described as being on a fracture of half a mile in length. It is significant that the discoverer describes this vein as "lying bleaching in the sun right at the lakeshore, where it has escaped discovery through the centuries" which gives an idea of the possibilities of this vast and unexplored area lying north of the railway, consisting of many hundreds of lakes scattered through the district of Patricia, where prospectors have not yet found their way.

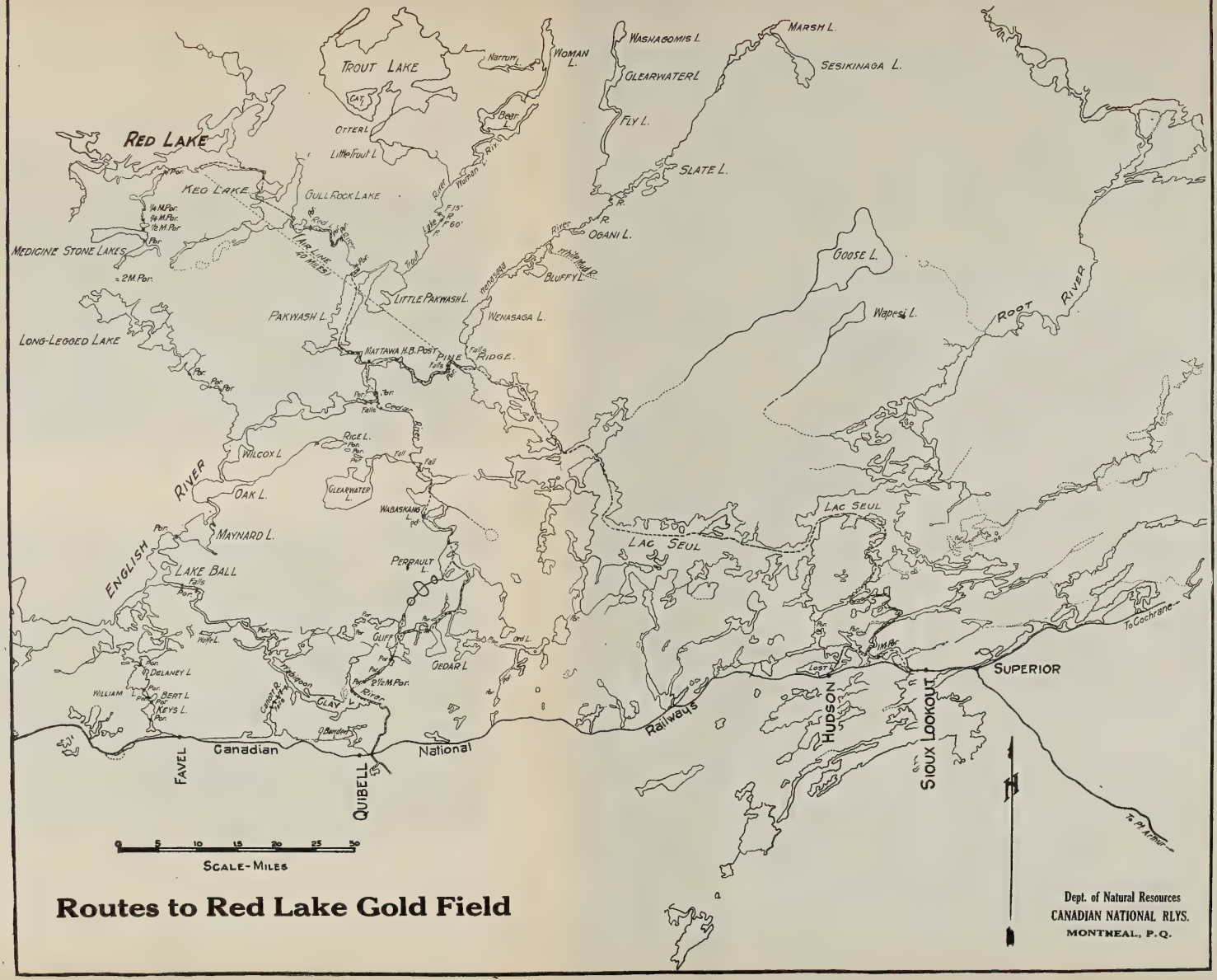
Sturgeon Lake.—When the St. Anthony property was first opened it was very remote from transportation and for various reasons was closed down. The advent of the Canadian National Railways changed the whole economic aspect, as it is only eight miles from Bucke Station, a mile by road and seven miles by water. Operations have been resumed at this property and it is reported that there are 50,000 tons of mill tailings at the mine which average $5.88 a ton. The company owning this property has also holdings in Mountbray township of Western Quebec. Other properties on this lake are the English River Company and United States Gold.

Red Lake.—The Red Lake gold area has attracted wide attention, due, in part, to the large amount of publicity given to it not only in Canada but in the United States. Interest has been largely centred on the Howey-Red Lake Company's properties which were, for a time, under option to the Dome Mines. These properties were very carefully diamond drilled and sampled and showed excellent returns reported to have been in the neighbourhood of $10.00, although certain samplings gave much higher values. The work done on this property has disclosed highly favourable geological conditions. The outcrops are composed of quartz porphyry and rhyolite. In the lower ground is a greenstone formation and it is in the greenstone, in close proximity to the intrusive rocks, that the more promising results have been obtained.

A number of the large mining companies have acquired properties in the district, including the McIntyre, Dome, Victoria Syndicate, Huronian Belt, Coniagas and other companies of importance. While it is early to predict the place Red Lake will take in the mining history of Canada, some of the best authorities are of the opinion that it will become a gold camp of importance and add materially to Ontario's rising production of gold. While the attitude of some of the older companies has, for the time being, produced a lull in activities, it must be remembered that Kirkland Lake and Rouyn passed through the same experience in their earlier days, but now compose two camps that are today among the richest in the whole world. Lacking effective transportation, costs are necessarily higher than in the camps referred to above.

The Red Lake Gold Mining Division has now been enlarged and takes in what was formerly a portion of the Kenora Mining Division, and extends from the Thunder Bay Mining Division on the east to the Manitoba boundary; the southern boundary, to all intents and purposes, is practically formed by the Canadian National Railways. The main gateways to the district are Hudson and Sioux Lookout, reached by the Canadian National Railways. There is a canoe route via Quibell, which prospectors occasionally employ, and which enables them to avoid the large body of open water on Lac Seul.

In 1921, the Ontario Government sent Dr. E. L. Bruce into the district. He examined a portion of this section and continued his work in 1923. Some claims were staked that year but the Howey claims did not attract public attention until 1925 when the rush commenced. In his report on the geology of the area, Dr. Bruce says, in part: "The country surrounding Red Lake has typical pre-Cambrian topography. In the western part the elevations have a linear arrangement controlled by the folding and by the intrusion of igneous masses parallel to the bedding of the sedimentary formations. The maximum



Routes to Red Lake Gold Field

Dept. of Natural Resources
CANADIAN NATIONAL RLYS.
MONTREAL, P.Q.

Typical View of Red Lake Area, Ontario.

Red Lake, Ont., Main discovery on Smith-Morrison Group.

difference of relief from the lake bottom to the top of the ridges is 265 feet; the hills rise 125 feet or less above lake level. In the eastern part the irregularities of the consolidated rock floor are masked by beds of lake clays. The chief elevation in this part are a few hills of glacial debris which project through the clay and the pronounced ridge several miles east of Red Lake, which is believed to mark the beach of the pre-Glacial lake in which the clays were laid down. The geological succession is similar to the succession in some other districts in which important gold deposits have been found. The occurrence of greenstone and old sediments of Temiskaming type with intrusions of porphyry and of granite provide suitable conditions for mineralization..... It may be possible that the gold deposition is closely related to the intrusions of porphyry, or perhaps to the combined intrusions of porphyry and granite."

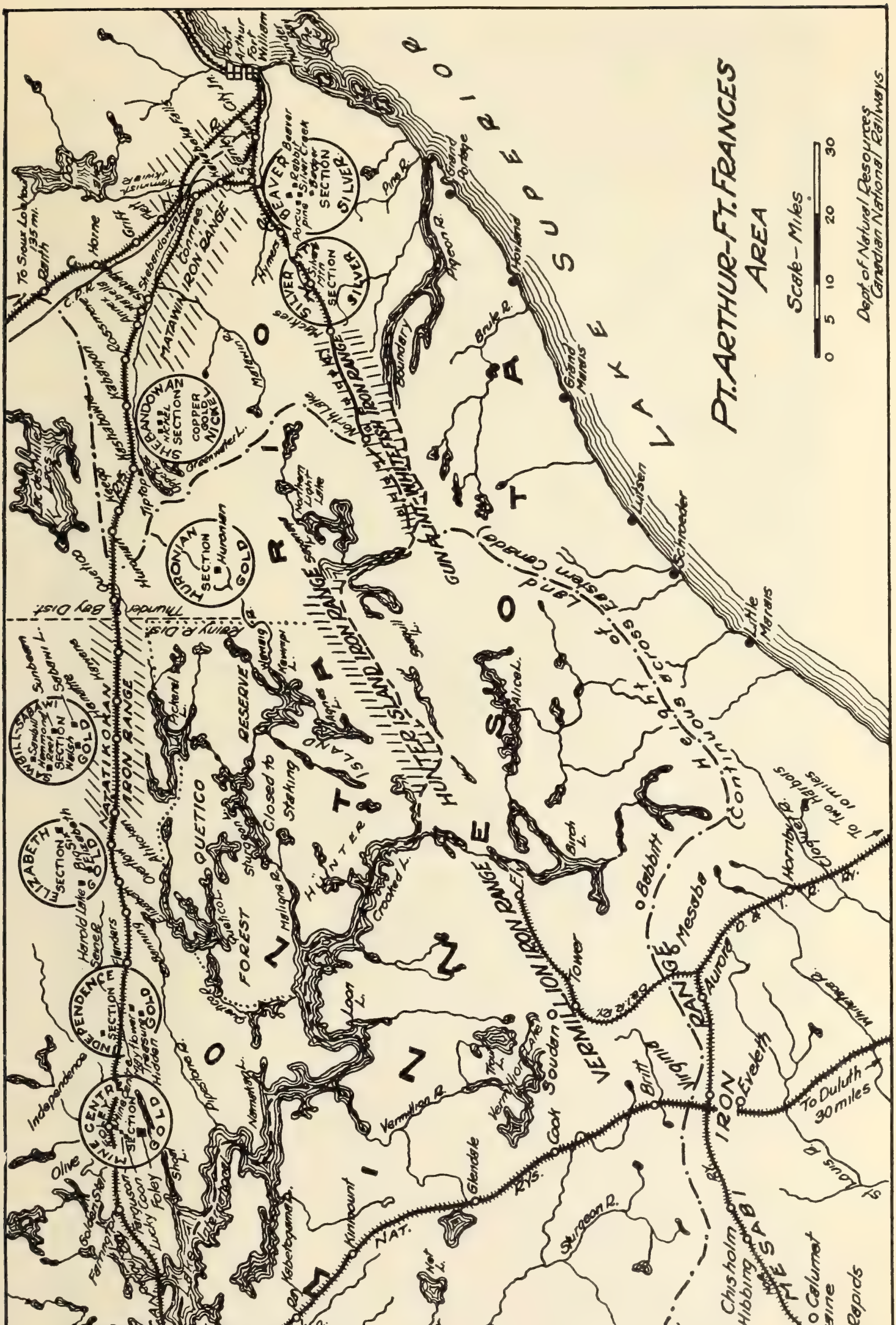
Narrow Lake and Woman Lake.—Discoveries were made in these areas, situated some forty-five miles north of Red Lake, in 1926. Some four hundred claims were staked at Narrow Lake and an even greater number at Woman Lake. While the deposits would appear to be of major importance, they will be at a disadvantage because of the distance from transportation, but a winter road has been constructed into the area. Some of the large operators are interested in the claims at Narrow Lake, including Mr. N. A. Timmins, and a group associated with the Noranda Mines.

Lake of the Woods-Seine River Areas.—The gold camps in these areas have taken on a new lease of life and the results at the "Huronian" and "Foley" mark a new epoch in mining in Western Ontario.

Amongst the properties that might be mentioned as having been worked years ago in the Lake of the Woods area, are the Sultana, which yielded between $700,000 and $1,000,000; the Mikado and the Regina, each of which produced about $500,000. Small quantities of bullion were also obtained from the Ophir, Olympia, Golden Horn and other small properties.

In the Seine River area, gold was first discovered in 1893 and bullion was produced from the Golden Star, Foley, Olive and a few other small properties. On the Upper Seine waters, the Elizabeth, Hammond Reef and Sawbill produced some gold. The causes that contributed to the failure to establish a profitable gold-mining industry are various. In most cases, mills were erected before developments had been carried on sufficiently to warrant the expenditure. There appears to have been a great lack of knowledge of the geological structure, and mining and milling methods were extremely crude. It will be remembered that cyanide was only just coming into use. The history of the operations in these areas is described by Dr. E. L. Bruce in Part VI of the Annual Report of the Ontario Department of Mines, 1925; by P. E. Hopkins in Vol. XXX, Part II, "Ontario Gold Deposits." 1921; also in the Royal Commission Report of 1900, copies of which are very scarce but which can be seen in the library of the Department of Natural Resources of the Canadian National Railways at Montreal, or at the Ontario Department of Mines, Toronto.

The Huronian mine, near Kashabowie, seventy-seven miles west of Port Arthur, has been re-opened. The discovery of gold at this point was made in 1871, but the property has lain dormant about forty years. Its location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Little Marais
Grand Portage
QUETICO FOREST RESERVE
Closed to Staking
VERMILION IRON RANGE
MESABI IRON RANGE
MATAWIN IRON RANGE
ATIKOKAN IRON RANGE
HUNTER ISLAND IRON RANGE
GUNFLINT IRON RANGE
Canadian National Rys.

Underground, Gold Mine, Northern Ontario

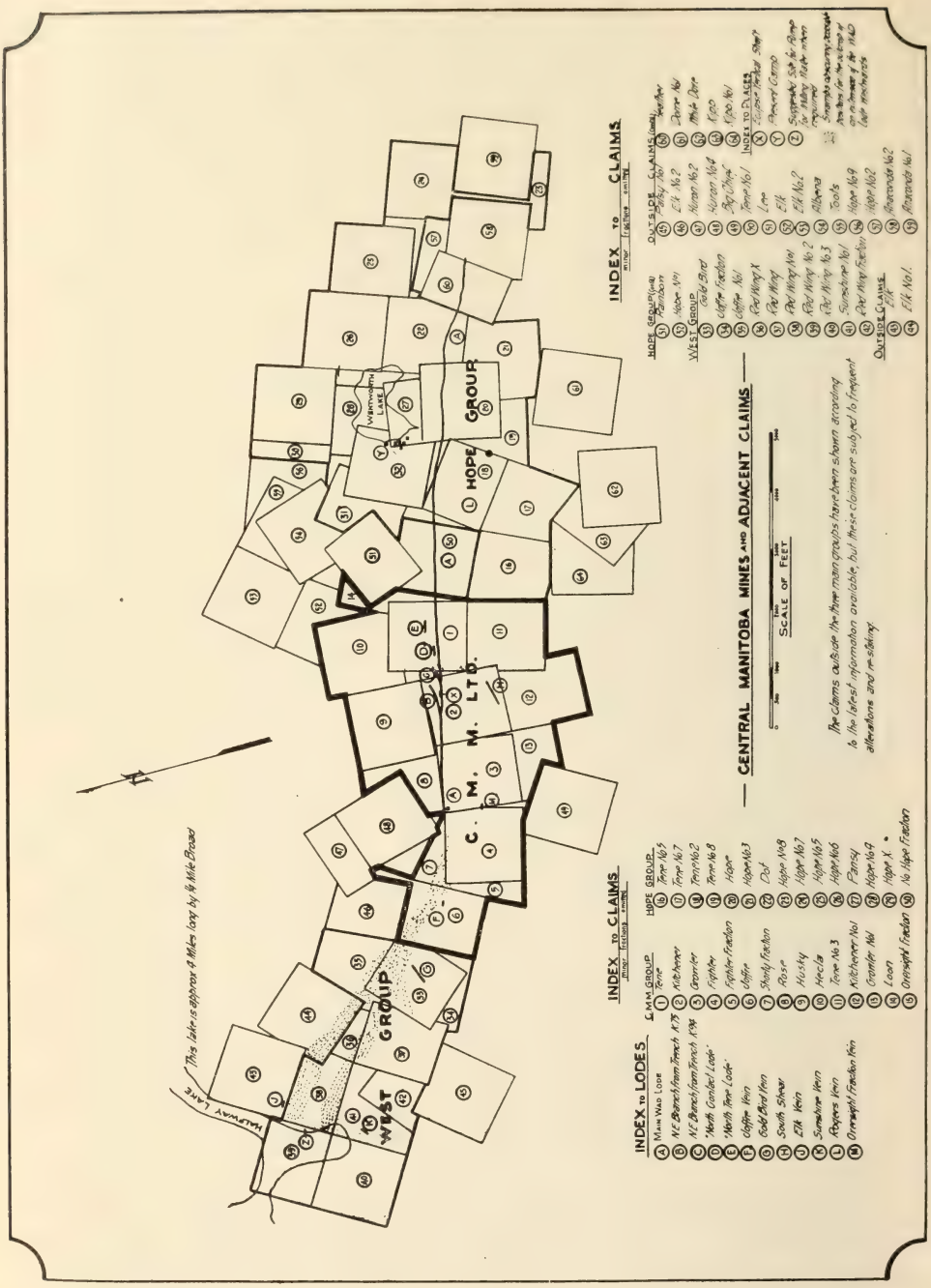
is HI in the township of Moss. According to Dr. A. P. Coleman's report, the deposit is a bedded vein from six to eight feet wide, of which two to five feet are white quartz, the rest being incorporated schists. The country rock consists of interbedded talcoid, chloritic, and dioritic schists, siliceous magnetite and diorite. The gold occurs free and as sylvanite (or tellurides of gold) associated with galena, iron and copper pyrites. It is of interest to note that a small intrusive area of granite well-exposed on Jack Fish Lake sends an arm southward within a short distance of the mine. Under the able direction of Mr. Norman Fisher, Consulting Engineer, this property is being developed by the Shield Development Company of Montreal, and gives every indication of constituting a major operation.

Since being re-opened, the Foley mine—first staked in 1893 but closed for many years due to mismanagement and litigation—is now showing encouraging results. Development indicates that the veins widen and the ore shoots lengthen with depth. Development has largely been confined to six veins: the Jumbo, Bonanza, Lucky Joe, Daisy, West, and "A". The Bonanza at the surface had a width of two feet, and Jumbo three feet; at the 850 ft. level, the Bonanza is six feet and the Jumbo sixteen feet. As Dr. Coleman once predicted, these veins would persist to depth and the development so far carried on shows this to be the case and while the values do not appear to increase, the mine, as a whole, shows a great improvement at depth. It is anticipated that in the near future the mine will be provided with power either from the Seine River or from Fort Frances. This will speed up development and also enable a number of economies in the mill.

Placer Gold.—There was a firmly established belief years ago that gold could not be found in the pre-Cambrian of Northern Ontario. Notwithstanding, large deposits have been discovered. The opinion has also been expressed that no placer gold can be found in the Province, though the weathering of the Huronian rocks has proceeded through many centuries and glacial action has played its part and the course of many stream beds changed. Dr. W. L. Goodwin says: "There are many evidences of placer gold in Ontario at the present time. As discovery goes forward and the old gold-bearing rocks are found to be so widespread throughout the known parts of Ontario, one must conclude that old placers did exist to an extent hard to parallel in any country." New interest has been aroused in some of the old stream beds, and possibly some surprises are in store, as a result of their examination.

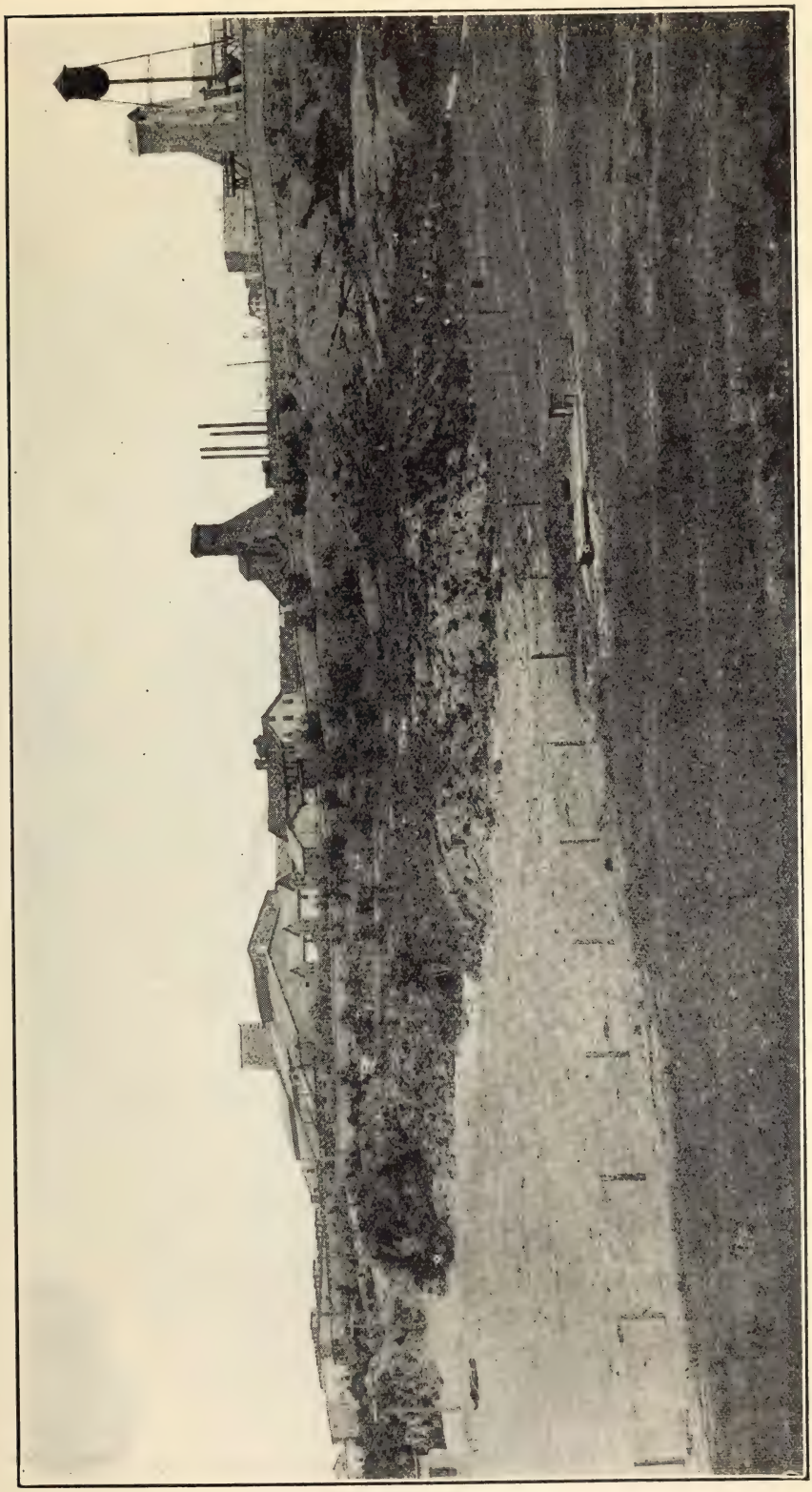
Manitoba:

The development of greatest promise and one which has done more to put Manitoba on the map as a possible large gold producer is in the Bulldog-Long Lake area, where, on the Kitchener property of the "Central Manitoba Mines" situated at Beresford Lake, adjacent to the boundary of Ontario, diamond drilling and sinking has disclosed bodies of ore of greater size than any so far found in the Province. This operation has paved the way for the establishment of a gold mining industry of importance. The ore blocked out shows high values, some of it running twenty dollars a ton. A long drift at the 375 foot level is reported to have opened up commercial ore 1,500 feet in length. At another point on the same break 4,000 feet away, another excellent body of ore has been



opened up, and a mill is being erected. With this operation is associated the name of that century-old outstanding British firm of John Taylor & Sons, whose knowledge of mining in the pre-Cambrian formation is quite unique in mining annals and goes back fifty years.

On the Cryderman claims of the Mining Corporation of Canada development has disclosed bodies of ore of larger dimensions than indicated on the



Hollinger Mine, Timmins, Ont.

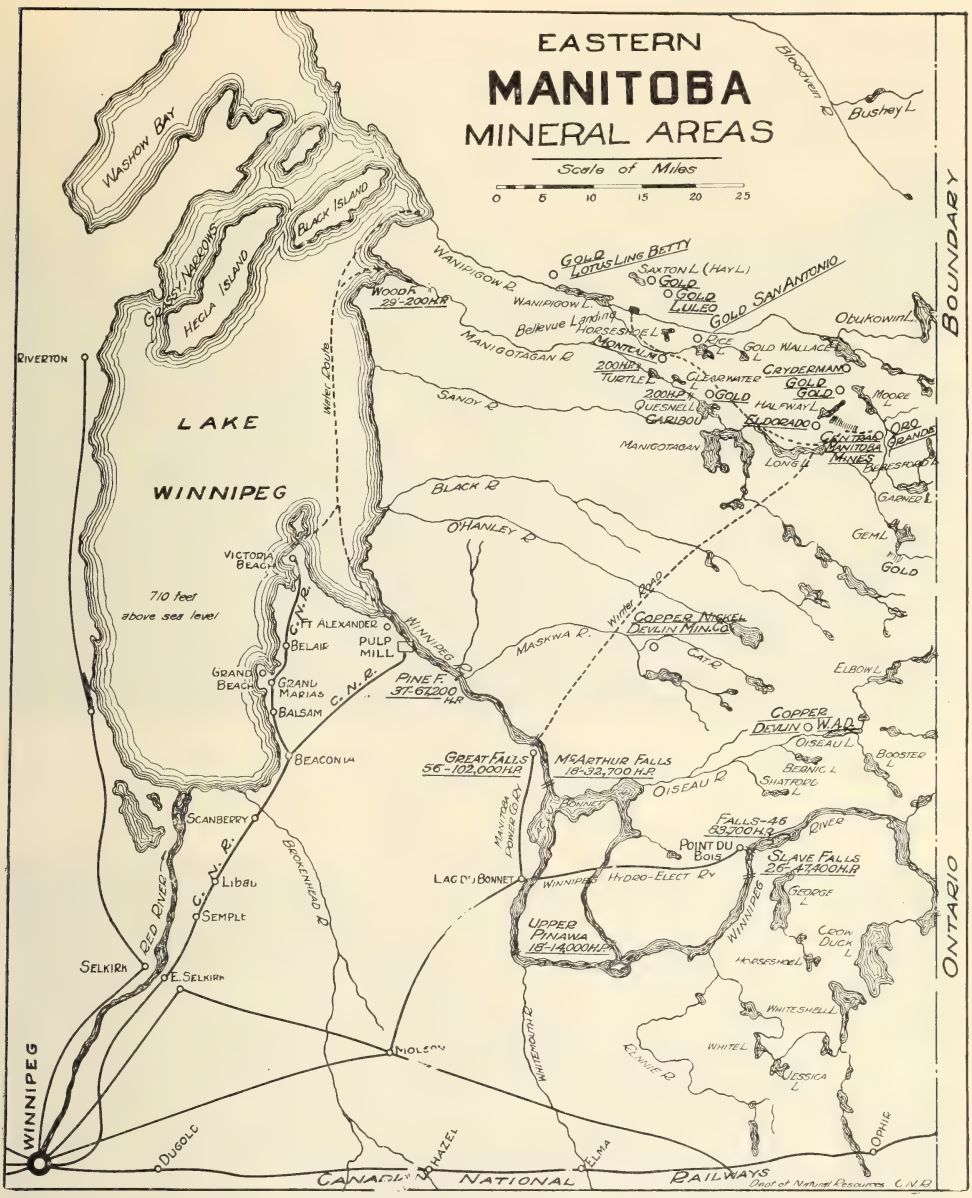
surface. Stripping and other surface work has resulted in their tracing a quartz vein for over 4,000 feet on the property. Here, in common with many other properties, the phenomena is observed of the values being found contiguous to the granite intrusions. Speaking of the occurrence of gold in Manitoba, Dr. R. C. Wallace says: "The gold occurs in fairly clear-cut veins, chiefly in rock invaded by the granite, such as greenstone or sediment, or somewhat quartzose, indefinite shear zones of mashed rock, in greenstone or sediment, or not infrequently in granite itself. As a rule, the gold occurs native, either separate in the quartz or fine-grained in the pyrite and other sulphides. Gold tellurides have, however, been found in several areas, most abundantly in shear zones north of Wanipigon (Hole) River Lake, but nowhere forming any considerable percentage of the total gold values. The associated minerals are to a degree distinctive of the districts. Pyrite is an invariable associate of gold, but arsenopyrite is characteristic of the Wekusko (Herb) Lake area, chalcopyrite of the Gold Lake—Long Lake area, and pyrrhotite of the Star Lake area. Galena, sphalerite, tourmaline, feldspar and, on occasion, stibnite, occur in the vein matter associated with the gold in one or other of the districts."

The Oro Grande, situated near the north end of Beresford Lake, has carried on development work with encouraging results and will be heard from in the future. Onandago is a property that has a shaft down 125 feet and is showing up in a satisfactory manner. More than half a million dollars has been spent on the Luleo claims, by the Selkirk Gold Mining Company; a quantity of ore is blocked out awaiting the advent of cheap power and improved transportation. The San Antonio is another property upon which stripping has disclosed a number of veins, the sampling of which gave satisfactory values. The English Brook section, somewhat to the north, has been the scene of numerous discoveries; amongst others the W.A.D Syndicate have holdings in the area.

Prospecting has been carried on for a number of years in the Rice Lake Gold area, east of Lake Winnipeg. The mineral-bearing country, to which the name applies, lies in the pre-Cambrian formation. The rocks include felcite, porphyry and greenstone schists, together with some altered sedimentaries, all of which have been intruded by porphyries and granites; many of these rocks are said to carry gold-bearing quartz in the form of veins and portions of shear zones, but the values so far disclosed are too low to make mining profitable under existing conditions.

Elbow Lake has been the scene of fluctuating activities. The first find was located at the outlet of the lake about one mile south of the extreme end of the peninsula which separates the inlet from the outlet. Since that time, showings of gold have been found at a number of points, the values occurring in quartz stringers in a quartz porphyry dyke. Where development work has been carried on, the indications are that the gold is distributed over a wide area, but, as a matter of fact, the money so far spent has been insufficient to prove up the district and since some of the mining corporations who took up options have released them, enthusiasm has waned.

There is every prospect that Wekusko (Herb) Lake, which was the first gold-bearing district discovered in Northern Manitoba, will become a producer.



Properties in the public eye are the Rex, where development has been carried on, a shaft sunk and some drifting; also the Northern Manitoba, where high values in gold have been found in a fissure vein. Other properties are the Bingo; Moosey; Dauphin; McCafferty, and the Cyclone Group.

Prairie Provinces:

Apart from alluvial gold, recovered in dredging operations on the North and South Saskatchewan, no gold mining of importance has been carried on in these provinces. As high as $50,000 is reported to have been recovered in one year in the North Saskatchewan near Edmonton. The fact, however, must not be overlooked that embraced in the northern part of Saskatchewan is a large

Fiddler Creek Basin, near Doreen, B. C.

Premier Mine, near Stewart, B. C.

area of the pre-Cambrian formation, some of it classed as "early pre-Cambrian" and much of it unclassified. It will undoubtedly be the scene of more intensive prospecting in the near future; the presence alone of the Flin Flon ore body on the boundary line between Saskatchewan and Manitoba is alone sufficient to indicate the possibilities of the area.

British Columbia:

The Premier Gold Mining Company is the leading producer of gold-silver in British Columbia. It owns sixty claims, of which 32 form a compact group that includes the Premier gold-silver mine at the head of Portland Canal, 11 miles north of Stewart, and is also in control of a number of other properties. This company, at the time of writing, has paid back in dividends twice its capitalization and will undoubtedly proceed at the same rate for many years to come. Recently, amalgamations that have taken place have much strengthened its position. The ore occurs at or in quartz porphyry sills, in contact with volcanic tuffs, as lenses in intensely sheared zones. The mine contains three main ore zones: two are replacement deposits, more or less parallel, fifty to one hundred feet apart, running along a contact between quartz porphyry and andesite tuffs; the third one runs almost at 90° to the other or northwest, southeast with a southeast dip. The ore lenses, or bodies are ten feet to forty, and average fifteen feet in width, are about five hundred feet long. The "veins" carrying these lenses widen slightly downward, though the bonanza ore does not apear below the No. 3 level or 600 feet vertically beneath the surface. The quartz porphyry is intrusive into and follows bedding planes of grey tuffs. According to the Dominion Geological Survey a granitic dyke cuts across both quartz porphyry sills and the slates, while a later quartz-augite diorite cuts the granite and, still later, porphyry cuts the ore bodies.

The equipment consists of an excellent mining plant, a 900 h.p. waterpower, electric light plant, crushing and sorting house, compressor, concentration and cyaniding mill, and an aerial tram handles 10,000 tons monthly from mine to bunker at Stewart, B.C. It is stated that there is some three to four years' supply of high-grade ore in the mine and millions of tons of $12.00 ore and, as the plant can make a satisfactory return on $8.00, the life of the operation is assured. The high-grade ore, $100.00 to the ton or better, is shipped to the smelter at Tacoma; the siliceous ore, $50.00 to the ton, to the Granby smelter at Anyox. The mill treates 100 to 120 tons a day of pyritic ore, $30 to $60 a ton.

The discovery in 1922 of very rich ground in the Cedar Creek camp and the Cariboo district indicates that high-grade auriferous gravel still remains undiscovered. In the Cariboo, Atlin and Manson Creek areas there are now a number of well-equipped plants working gravel deposits that were too low-grade for the small-scale methods of the early miner. The placers of the Cariboo district have produced gold to the extent of about $50 million all told. Large deposits of low-grade gravels are known to occur in many of the old placer camps and the working of many of these by dredging methods is being carried on or projected. Much attention has recently been directed to the placer deposits of the Barkerville area, which is reached from Prince George by steamer to Quesnel and from that point to Barkerville by stage. A trail from Barkerville to Keithley and wagon roads give access to the creeks where placer operations are being carried on.

The Barkerville area may be briefly described as a deeply dissected high-level plateau, with an altitude of from 6,000 to 6,200 feet. While some of the gravels are of post-glacial age and though the region was glaciated, the gold placers were not destroyed or materially eroded. Bench deposits occur on many of the creeks at various levels above the creek bottom. It is explained by the Geological Survey that the area was glaciated during Pleistocene time, and although the gold-bearing gravels were found by the early prospectors to be in place, yet in most places they were deeply buried beneath glacial deposits, thus making it difficult to recover the gold, which is the reason why a considerable part of it still remains. In the Barkerville area, the important gold-bearing streams include the historic Antler, Williams, Lightning, Grouse and Jack of Clubs.

During 1926, highly successful results were obtained by the Kafue Copper Development Company's dredge on Antler Creek. This dredge was operating in a portion of the creek which is very rich and it is stated that in one month gold to the value of $38,000.00 was recovered. Hydraulic operations on Cedar Creek were spectacular; it is stated that one week 651 ounces of gold were recovered, one nugget weighing 17 ounces. Amongst others, hydraulic operations were conducted on Lowhee Creek and at Kitchener, on Keithley Creek.

There has been for some time past a return of activity in the hydraulic workings along many of the streams tributary to the Fraser and Thompson rivers and gold is being recovered from many of the gravel bars of these rivers.

Vancouver Island, as well as Texada, and others lying between the mainland and Vancouver Island offer great attractions to the prospectors for the reason that the area of sheltered waters is very great. This affords excellent opportunities for establishing main camps from which the exploration of rivers and streams going into the inlet can be carried on. The mineral resources of the district are very diversified and include free-milling gold ore, gold-copper-silver ores and other composite ores, some of which are extremely refractory. The free-milling gold ores are found usually to occur in narrow quartz veins, in fissures, in porphyritic and diorritic country rock, and according to the B.C. Resident Mining Engineer, although generally quite narrow, some of the quartz gangue in the veins contains high values. These occurrences are recommended to individual miners who thoroughly understand mining and amalgamation, but are hardly of sufficient extent to warrant company organizations, where the overhead expenses are usually out of proportion to the small scale of operations.

B. C. Gold Mines operating five Crown-granted mineral claims, situated on Texada Island, and other claims held under lease is carrying on some excellent development work and would appear to have every prospect of success.

In the Kitsumkalum Lake and Terrace sections, there are a number of properties of promise showing high values in gold. Active development is being carried on; this offers a good field for investigation and mining development.

The New Hazelton Gold-Cobalt Mine was re-opened in 1926; the ore on this property carries gold, arsenic and cobalt.

Richfield near Topley, fifty miles east of Smithers, was the scene of an important find in 1926, which has proved a great stimulus to prospecting.

Since the original claims were staked much prospecting has been done in the vicinity and some of the claims have shown up remarkably well, particularly the group consolidated by the original discoverer. Development upon these claims is proceeding. (This area is dealt with under SILVER).

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IRON

Iron ores are widely distributed in the Dominion, but at the present time, regardless of the extensive manufacturing industry in iron and steel carried on in the country, little or no domestic ore is being used, practically all being imported from the Lake Superior mines of the United States and the cheaply mined ores of Newfoundland. There are however a number of important iron ore deposits that have contributed a considerable output in the past. It is realized that if Canada is to maintain an iron and steel industry it is essential that her domestic ores be utilized. It is, however, an accepted fact that the ores at present available in Eastern Canada need beneficiation in one form or another. To the furtherance of this end investigations have been carried on to determine the best methods of beneficiating the various ores, to make them available for use in the furnace, and much progress has been made in this direction. Such

Moose Mountain Iron Mine.

a development is of the greatest possible importance to the Canadian National Railways as the principal iron deposits in Eastern Canada are situated on or tributary to its lines, and should be a most important source of traffic.

It is felt by mining men and those desirous of seeing our iron ores developed, that considering the encouragement given in the past, in one form and another, to other activities, it is imperative that due consideration be given the advisability of some form of public assistance such as that offered by the Govts. of Ontario and Quebec to stimulate production and utilisation of these important national assets now entirely dormant. As an example of the benefit the country might derive, attention is being directed to the fact that as a result of such assistance an iron and steel industry has been built up which is a credit to Canada, and which with the diminution of the Lake Superior ores will in the near future be seeking the Canadian product to replace them, providing such ores are available at a cost which will make their utilization possible. It must be borne in mind that it is computed that the reserve of hematite ore of merchantable grade in the Lake Superior region of the U. S. will be nearing exhaustion at the present rate of consumption in twenty-five years, and before that occurs there will be a curtailment of the supply available for the Canadian iron and steel industry, thus, if we are to maintain this important basic industry, we must develop our own supply of raw material.

It has been pointed out that "the expenditure on labour and supplies necessary for the production of the ore and the profits to be derived from its transportation would repay the country many times, whatever the form of assistance given entailed."

The most important deposits so far discovered are those of the Rainy River, Michipicoten, and Thunder Bay districts, Moose Mountain and vicinity, also various deposits in Central Ontario.

Nova Scotia:

The principal deposits are those at Clements Port, Nictaux, and Torbrook in Annapolis County, Brookfield and Londonderry in Colchester County, and the Pictou Iron Range in Pictou County. These include hematite, magnetite, bog ore, limonite and carbonates.

New Brunswick:

In Carlton County near Woodstock; West Beach and Black River on the Bay of Fundy; near Lepreau and Charlotte County; Township of Bathurst, County of Gloucester.

Quebec:

Along the north shore of St. Lawrence, beds of magnetite have been found at many points. Dr. A. P. Low reported valuable deposits of iron near the height of land about two hundred miles north of the St. Lawrence; this bed is of great magnitude and contains limonites, hematites and magnetites.

Deposits of titaniferous ore occur in Ivry, Temiscouata County, also near St. Jerome. Large deposits of this ore occur in Bourget township on the north bank of the Saguenay River, reached from Jonquière on the Canadian National Railways. Aside from smelting titaniferous ores for pig iron, modern practice

finds other uses. The cheap power available in the Lake St. John area gives these particular deposits immediate commercial value as raw materials for the manufacture of titaniferous white pigments and electrolytic iron. Only introduced recently, there is little doubt the use of these products will become very wide and open new fields for the utilization of our extensive bodies of titaniferous iron ore.

In the St. Francis River district, east of the St. Lawrence and on the St. Maurice River to the west, limonite or bog iron ores were mined for nearly two hundred years, small furnaces being in fairly continuous operation at Drummondville and Radnor Forges, producing an excellent quality of charcoal pig iron.

Ontario:

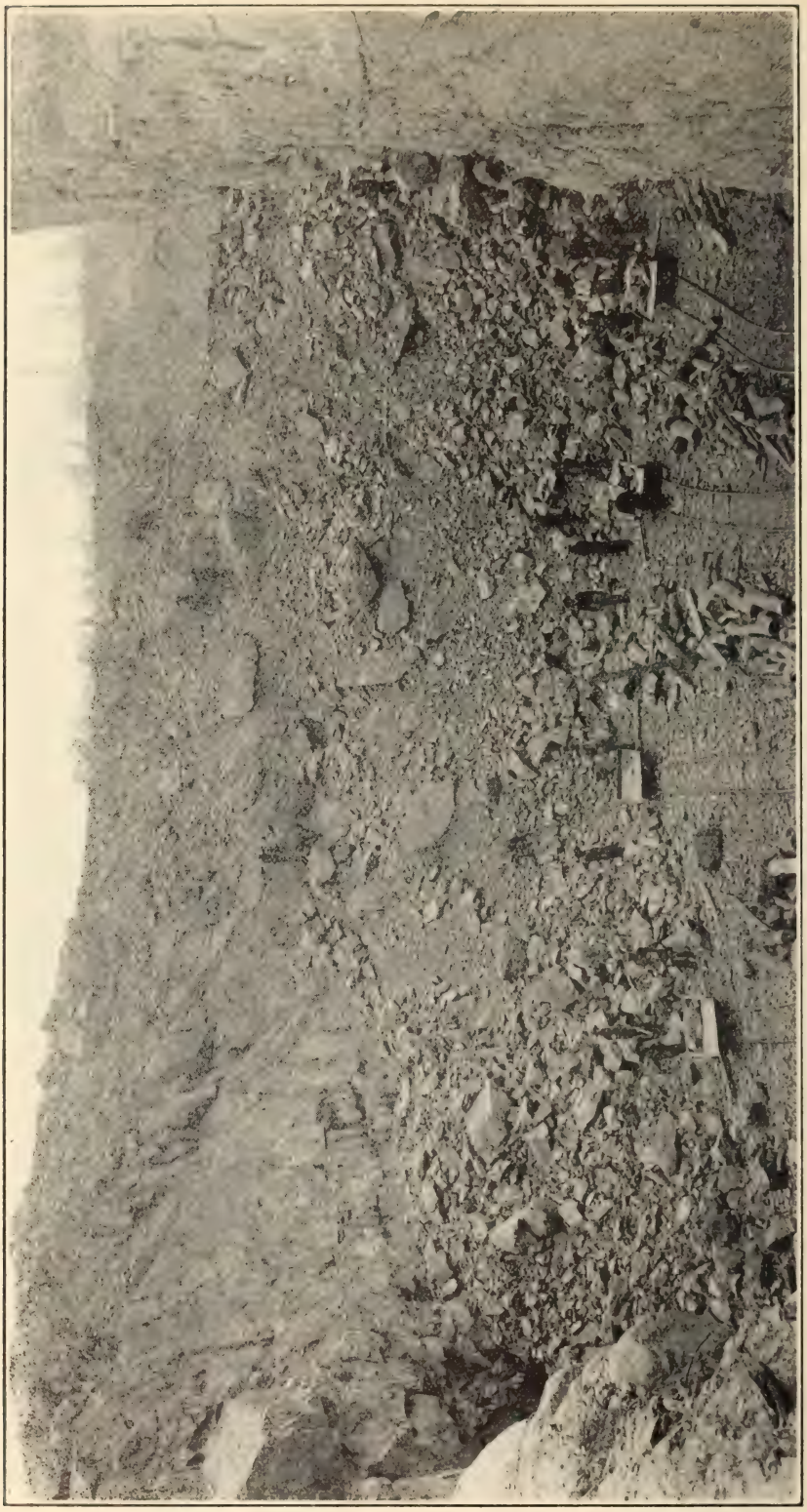
The first iron furnace in this Province was erected about the year 1800 at Furnace Falls, now Lyndhurst, in the County of Leeds, at the falls of the Gananoque River. The ore used was of inferior quality, and after about two years the enterprise was abandoned.

From the report of the Royal Commission, on the Mineral Resources of Ontario, 1890, it would appear that in the year 1822, Joseph Van Norman started a blast furnace in the county of Norfolk for the smelting of bog iron ore. Another furnace was erected a little later by a Mr. Hayes at Marmora, in the county of Hastings, who obtained from the Government, for mining and charcoal purposes, a tract of 14,000 acres in the townships of Marmora and Belmont. The non-success of the latter appears to have deterred enterprise in this field, and for the following 20 years the records do not show any activity in the sale of mineral lands, nor in the search for the discovery of mineral ores of any kind.

This province is credited with the largest total production of iron ore of any of the provinces of Canada. It may be said, however, that up to the present time comparatively little high grade ore has been mined. It has been remarked that the international boundary appears to divide riches from poverty as far as iron ore is concerned. While no large quantities of ore of merchantable grade have so far been disclosed in Ontario, it must be borne in mind that the amount of diamond drilling done in this province is very trifling, also that few of the ore occurrences on the south shore of Lake Superior were found to outcrop; it was in the main by following the lean, siliceous and magnetic iron formations which had withstood erosion that commercial ores were finally discovered by underground methods.

While good work has already been done by geologists in our iron areas, it is felt that detailed knowledge is still lacking, and it is proposed that further intensive work be carried on by geologists specially fitted for the task. When this work is carried out, it is highly probable that diamond drilling properly directed will disclose secondary enrichments of which there are no surface indications. The principal iron deposits, situated on or tributary to the Canadian National Railways, are as follows:—

In Eastern Ontario, the Coehill and Bessemer mines have been operated with some success. Results of wet magnetic separation and sintering tests on ores of the Childs Mine, Bessemer, made by the Department of Mines, demonstrated that the sinter produced was hard and extremely porous — an ideal



Open Cut—Iron Mine

product for the blast furnace. There is every prospect that these mines will be opened again and, under modern practice, operated profitably.

There is a deposit of hematite ore found near Delta. The Moose Mountain deposit, situated in the township of Hatton — a large deposit of banded magnetite; very similar bodies of ore are also found at Burwash and Onaping. At Moose Mountain extensive development work has been carried on and much time and money spent in experiments and investigations of the best means of beneficiation, that will be of great value to the industry at large. The mines of the Michipicoten Range, including the Helen and Magpie, have been the largest producers in Ontario. Other deposits include the Onaman Range, Little Long Lake, Lake Nipigon and Black Sturgeon Lake; and the Loon Lake deposits situated east of Port Arthur. Near Gravel Lake, southwest of Port Arthur, there is an important occurrence which is considered an eastern extension of the Messabe Range, composed of hematite capped with taconite.

The Kaministiquia and Mattawin Ranges, west of Fort William, show large outcrops of banded jaspilites, averaging 35 per cent iron and better. On the Atikokan Range, east of Sabawe Lake, the Atikokan iron mine has proved by diamond drilling, over ten million tons of ore. This ore requires beneficiation before being fit for the smelter, as while its iron content is high it averages over 2 per cent in sulphur. During the latter period of the operation of the blast furnace at Port Arthur, it was found that these ores could be cheaply beneficiated by roasting, the waste furnace gases being utilized.

West of Sabawe Lake a large body of high sulphur ore has been demonstrated by diamond drilling which also lends itself readily to beneficiation by roasting. Other districts in Ontario along the Canadian National, where hematite iron has been found, are Steep Rock Lake, Gunflint Lake, Ground Hog River, and Hunters' Island. In the extension of the Messabe Iron Range in Ontario are undeveloped ore bodies of a grade which it is believed will prove commercial.

British Columbia:

Deposits of magnetite of a good grade, and brown hematite exist in northern British Columbia. There are limestones and other fluxes, and coking coals either contiguous or within transportable distance. The various bodies are investigating these resources to estimate the quality and quantity of the deposits and other economic factors essential to determine the basis that would support commercial operations.

Reports made on the Copper River district show that deposits of limonite ore of economic importance exist some forty miles south of the line, nearly midway between Telkwa and Terrace. On the east shore of Graham Island, also on Porcher, bodies of magnetite ore of considerable magnitude are reported. On Vancouver Island, in the districts opened up by the Canadian National Line, in the vicinity of Barclay Sound and Alberni Canal, are deposits of magnetite ores of some magnitude. Part of this ore, according to the Bureau of Industrial Research of the University of Washington, is of "a character that can be shipped direct to the blast furnaces without preliminary treatment". When furnaces are established at the Coast on a commercial basis, the ores of British Columbia may play an important part in the industrial development of that province.

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LEAD AND ZINC

Nova Scotia:

Deposits of argentiferous galena have been worked near Musquodoboit, Halifax County, and in Cape Breton in the pre-Cambrian rocks. It also occurs at various points in the Lower Carboniferous limestones.

The Sterling mine in Cape Breton carries values in zinc, lead and copper. Development work carried on by stripping, trenching and drilling indicates a mineralized area of over 800 feet in length and in places up to 200 feet in width. A shaft has been sunk to 400 feet and the body explored by means of drifting and cross-cutting. The rocks in the region of the deposit are composed of rhyolite, highly altered, sheared greenstone and a talc schist. The metallic minerals are sphalerite, galena, chalcopyrite and pyrite.

The Smithfield property, Colchester County, idle for about thirty-five years, is being operated with prospects of success. When it was closed lead was selling at three cents a pound. The property is situated about thirteen miles from the Canadian National Railways at Brookfield, two and a half miles off the main highway between Brookfield and Upper Stewiacke. Near Cheticamp some development is being carried on with extremely encouraging results.

Quebec:

In the Gaspe Peninsula a discovery of lead and zinc was made in 1909. A great deal of development work has been carried on on these properties by the Federal Zinc and Lead Company and large bodies of lead and zinc have been disclosed. Those properties have been taken over by the National Smelting Corporation of London, who control the principal lead-zinc mines and smelters of Great Britain, Australia and other parts of the Empire. The zinc and lead is in the Lower Devonian, principally slates, sandstone, limestone, porphyry, syenite and basalt. The rock in which the zinc and lead sulphides occur is generally a slate considerably dilated and fractured and in proximity to porphyry and syenite in the form of flows and dykes, which have disturbed the country to a marked degree. Active work has been somewhat handicapped by lack of transportation but the Company, in conjunction with the Quebec Government, built a high road from the property to Cascapedia. Adjoining the Federal Zinc and Lead Company on the west, the Pioneer Mining Corporation is actively developing a property with encouraging results; also a syndicate associated with the Harvie Mines is opening up another property.

At Notre Dame des Anges, the Tetreault property, operated by the British Metal Corporation, contains a body of lead and zinc. This property has been worked on and off for a number of years and in 1925 when the present operators commenced work in earnest, shipped over seventeen thousand tons of concentrates.

Underground, Gold Mine, Northern Ontario.

Important bodies of zinc occur in the Rouyn mining area. Promising discoveries have been made at the Horne on the Noranda property, at Amulet, Waite-Montgomery and Abana, in the township of Desmeloizes

Ontario:

The Kingdon mine at Galetta, on the Ottawa River, which has been operated since 1915, was the only active producer in Ontario in 1926. The occurrence at this mine is in the form of a vein occupying a well-marked fault fissure in pre-Cambrian rocks, mainly Grenville limestones and gneisses, which have been cut through by intrusives. The ore is galena; sphalerite and pyrite occur in minor quantities. The ore is treated in a concentrating mill of 200 tons capacity. Zinc blende is separated from the galena concentrate and the galena is then smelted in the plant of the operating company.

Galena is found distributed over a wide area in Eastern Ontario and while the bodies so far disclosed are not large, many of them warrant operation. The more important of these are in Carleton County and in the townships of Tudor, Madoc, Cashel and Lake, Hastings County, where the blue limestone is traversed by a prominent system of fracturing. Attention is particularly directed to an occurrence which crosses the southern boundaries of the townships of Carleton and Limerick, which can be readily followed for a distance of over 1½ miles. Operations at the Frontenac mine near Perth Road have been renewed. In conjunction with this property, a smelter was operated at Kingston, known as the American Smelting Company, treating ores from the Counties of Frontenac and Hastings. At the present time it is idle.

The development now being carried on by the Bunker Hill and Sullivan Company is fraught with great possibilities, and will mean the opening up of a new industry of great magnitude. This company is carrying on development on their 4,000 acre property, which extends from Chelmsford to the Vermillion River. It comprises a section of ground which roughly parallels the southern contact of the Sudbury basin. It is believed that the ore occurs in a major fault in the slates, just north of and not far from the tuffs. While zinc is the main metal constituent, values in copper lead and silver are disclosed by the drilling. To the end of 1926, over 60,000 feet of diamond drilling was carried on with results sufficiently encouraging to warrant underground development. A shaft was to be sunk to a depth of 400 feet and lateral developments commenced. It has every appearance of becoming a major operation and, on the strength of it, the whole country in the inner basin of the Sudbury nickel field has been staked and claims recorded in townships outside the area, where similar formation is found.

In the townships of Genoa and Mario, west of Stacpoole, Sudbury Mining Division, some claims were staked for iron in 1908 and development resulted in the finding of lead and zinc. These properties are of a character that should attract capital for development.

The Enterprise mine, located near Pearl, thirty miles east of Port Arthur, after laying dormant for many years, is again being operated. This property was first opened up in 1865 and a shaft was sunk to a depth of 200 feet and some ore shipped to Swansea, but, as this had to be transported by sailing vessel and the price of lead being only about half what it is at the present time, the operation

did not prove profitable. The occurrence is described in the Ontario Royal Commission report as follows: "The gangue is quartz calcspar and barytes and the total width of the vein is from six to eight feet, of which from three to four feet consisted for some distance of solid galena with a little copper pyrites and vein matter". Adjacent to the Enterprise is another prospect, known as the Silver Lake, which is being operated by the same financial interests.

British Columbia:

An important discovery of lead has been made 25 miles up the Finlay from Fort Grahame. It is situated 1½ miles from the Ingenika River at a point about twenty miles upstream from its confluence with the Finlay River. In describing this property Mr. Douglas Lay, Resident Engineer, says: "It lies approximately in the centre of a narrow strip of pre-Cambrian formation which extends for some 125 miles north and south of Fort Grahame and some 20 to 25 miles east and west of the river systems, Finlay and Parsnip, which have their courses in the Rocky Montain trench. This pre-Cambrian strip is of particular importance from the mineral standpoint, because the pre-Cambrian area in East Kootenay, occupying a precisely similar position in the Rocky Mountain trench, has produced the great "Sullivan" and other famous lead mines of that district. The remarkable points of similarity between the two areas, both topographically and geologically, justify the hope that a second Sullivan will be found in the northern area and warrants the most thorough probing of the latter."

Large quantities of lead-zinc are mined in the older section of British Columbia. The main camps are those at Nelson, Greenwood, Slocan, Ainsworth, Arrow Lake, Trout Lake, Lardeau, Windermere, Fort Steele and Kimberley. The Consolidated Mining and Smelting Company Limited at Kimberley, operating the Sullivan mine, is the largest single producer of lead and zinc in the world.

Silver-lead-zinc ores are being mined at Adams Lake and Blackpool, near Kamloops. Deposits of promise are reported in the vicinity of the headwaters of the Clearwater River and Thunder Creek, in the Kamloops Mining Division. In the country served by, and contiguous to, the Canadian National Railways between Burns Lake and Terrace, there are a number of operating mines and encouraging prospects. Operating properties are mainly located in the Portland Canal, Skeena, Omineca and Cariboo Mining Divisions. In the Portland Canal Mining District active operations are being carried on on the Salmon, Bear and Marmot Rivers; in the Omineca District, on Nine-Mile Mountain, Glen Mountain, Babine Mountain, Taltapin Lake; in the Cariboo Division, at Prosperine Mountain and Giscome Portage; and the Skeena, Alice Arm district, on the Kitsault and Nass Rivers. These areas are also dealt with under SILVER.

In the Portland Canal Mining Division, the values in the mines up to the present time have been mainly silver, although reports of the Department of Mines show that many deposits carry economic quantities of zinc blende, galena, chalcopyrite and pyrite, in a quartz gangue. The ores of the district are classed in three main groups — first, the type, rich in silver, found in the Premier mine, Silver Tip and other properties; second, the low-grade complex ores with values in base metals, copper, lead and zinc, found on such properties as the Big Missouri, Hercules, Forty-Nine, etc.; third, a pyritic siliceous type, with high gold values, one of the ore bodies in the Premier mine being an example.

In the Hazelton section on the Silver Standard at Glen Mountain, about four miles from the railway, the returns from ore milled give values in zinc, lead, silver and gold.

Bib.—GSC Report 1894, Vol. VII; GSC Report 1916, page 254; Dom. Dept. Mines Investig. of Min. Res. and the Min. Ind. 1923 and 1925, "Notes on Zinc and Lead in Eastern Canada" and "Zinc-lead mining in British Columbia".

MANGANESE

Manganese forms a part of about one hundred minerals, and is a comparatively widespread element.

Ores found in Canada comprise, pyrolusite, manganite, psilomelane and wad or bog manganese. Pyrolusite is used in the manufacture of steel, electric dry batteries, to colour glass, porcelain, brick and enamel; as a dryer in varnish manufacture, and as an alloy in several metals. As small quantities of manganese alloys are essential in making almost all steel, there is a steady demand for these ores.

Nova Scotia:

Mining operations have been conducted at Loch Lomond, Cape Breton, Tennycape, East Onslow, Londonderry in Colchester County, and New Ross in Lunenburg.

New Brunswick:

There are numerous occurrences and production has been obtained from Markhamville, Jordan Mountain in Kings County; Quaco Head, St. John County; Shepody Mountain and Dawson Settlement, Albert County. There is an important deposit on the upper north branch of the Canaan River. In 1915 shipments were made from near Adamsville, Kent County, but an embargo being placed on its export, the operation ceased. Important movements are on foot to establish chemical industries in the Maritime Provinces based on salt, coal, and the many other minerals available that will be contributing factors. With cheap supplies of chlorine these manganese ores can be beneficiated and thus find a ready market.

Quebec:

In the Magdalen Islands — Amherst Island, Grindstone Island.

British Columbia:

There is a producing property known as Hill 60 on Cowichan Lake. According to the B. C. Bureau of Mines this property shipped in 1920 nearly 600 tons running over 50%. With improved facilities the production will be increased.

Bib.—GSC "The Geology and Mineral Resources of New Brunswick, #983; GSC Reports "Hants County, N.S." 1905; "Cumberland County," N.S., 1908; and "Albert County, N.B." 1915; Final Report Munitions Resources Commission Canada 1920.

MERCURY

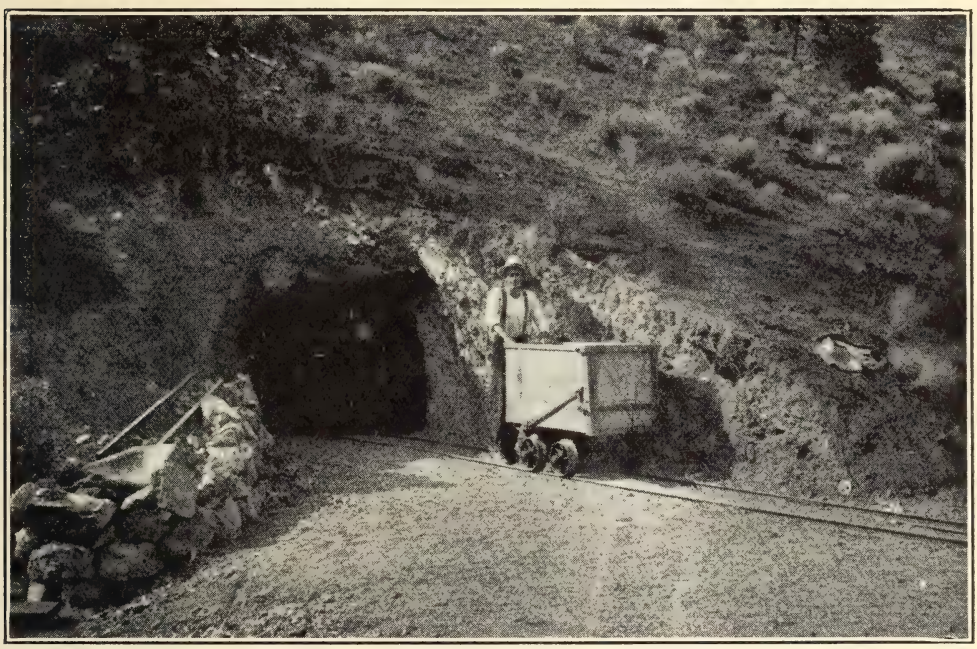
The most important use of mercury is as a fulminate in blasting caps and other detonators. The metal, its mercurous and mercuric chlorides, and other compounds are used in medical preparations. Anti-fouling paints for ship bottoms are made with oxide of mercury which the salt in the sea water converts into mercuric chloride, thus forming an active poison. Mercury is also used in heating, electrical controlling apparatus, vapor lamps, cosmetics, vermilion, boiler compounds, dental amalgam, in thermometers, and by hatters and furriers in preparing raw materials.

A possible important use of mercury is in the Emmet boiler. Mercury is generated in a fuel-heated boiler to drive a turbine; the exhaust from the turbine heats a second boiler that serves as both a condenser for the mercury and a source of steam for a steam turbine. The mercury is used in a closed circuit.

British Columbia:

The main occurrences of importance in Canada of cinnabar, or sulphide of mercury, are in the Kamloops Mining Division.

The deposits of Kamloops Lake, were reported upon by Dr. Chas. Camsell in 1918, and included in the report of the Geological Survey for that year. He says, in part, "The deposits occur at intervals along a belt twenty-five miles



Cinnabar Mine, Copper Creek, near Kamloops, B. C.

in length which extends from the west end of the lake northward to Criss Creek and southward to Tunkwa Lake. The principal deposits are situated in the valley of Copper Creek, one group lying at the mouth of the creek overlooking Kamloops Lake and another group about four miles up the creek on the east side. Other deposits of less importance occur at Tunkwa Lake, at the mouth of Three Mile Creek and also in the valley of Criss Creek. The deposits are all of similar character, occupying fissures which have no regular or uniform strike, and which traverse both the Nicola series and the Tertiary volcanic rock. The veins carry cinnabar, frequently associated with stibnite in a gangue of quartz, calcite or dolomite". In the opinion of Dr. Camsell the deposits are not likely to attain depth.

The main line of the Canadian National Railways runs through the properties consisting of nine claims at the mouth of Copper Creek, the deposits being

within half a mile of Copper Creek Station, and some 400 or 500 feet above the level of the lake.

Until 1925, when these properties were re-opened, they had remained more or less dormant since 1897. From 1895 to 1897, 138 flasks were produced equivalent to 10,557 lbs. of mercury. The failure of the operation would appear to have been attributable to defective plant rather than to the grade of ore. It is possible that with improved methods of treatment, this industry may be revived as there is a ready market in Canada for the product, the estimated demand being some 350,000 pounds annually.

Cinnabar is also recorded by the Geological Survey as found in the Alberni Mining Division, with native mercury in a greenish-grey felspathic rock at the eastern entrance of Sechart Channel, Barkley Sound, Vancouver Island. It has also been found in small quantities in the gold washings of the Fraser River, Boston Bar.

Ontario:

Small quantities of mercury were recovered from the Kerr Lake Silver Mine, Cobalt. It has also been recognized in the ore of the Nipissing mine.

Bib.—GSC Report 1911, "SW Miramichi"; GSC Report 1907 "Nova Scotia"; GSC Reports 1912 and 1914; GSC Summary Report 1918, Part "B", "Mercury Deposits of Kamloops, B.C."

MOLYBDENITE

Molybdenite is the common ore of molybdenum, and much like graphite, has an appearance of bluish lead-grey. It had a limited application in commerce prior to the war. Several alloys of importance are now produced with it; amongst these are molybdenum-cobalt; molybdenum-chrome; molybdenum-stellite, composed of molybdenum, cobalt, chromium and iron.

Its most important use is for toughening steel; it enters into the production of wire, car steel, rifle barrels, the cores of large guns, armour plate, automobile parts, high-speed machine tools, submarine hull parts. Other minor uses are in the manufacture of electric lamps, X-ray tubes, and thermo testing apparatus, electric contacts and breaking devices, where it is taking the place of platinum. It has various uses in the chemical industry and compounds of it are employed as a mordant for dyeing fabrics, colouring leather and rubber. It is said that it can be employed as a preservative for cordite in hot climates. It enters into various secret processes in connection with the manufacture of munitions. England, France and Germany, its principal users, prior to the war, received their supplies mainly from Australia, Norway and Japan.

Quebec:

This mineral occurs in Northern Quebec in the district south of Amos, on Peninsula Island in Preissac Township, and east of Lake Malartic, where the line of La Corne, La Motte and the townships to the south, intersect. These areas are reached by water route up the Harricanaw river from Amos. According to the Dominion Department of Mines, the molybdenite occurs in a network of pegmatic quartz-feldspar veins, in many of which the mineral is carried in

a sericitic schist. It is also found in the vicinity of Lake Kewagama. Indications are that this mineral will be found over a much wider area.

It is possible that following the discovery for new uses for this metal, which found a ready market during the war, the demand may warrant active mining operations. There is an important operating mine at Quyon within transportation distance of Fitzroy Harbour, where large quantities of ore have been blocked out. This is the most important molybdenite property operated in Canada up to the present time.

Ontario:

The Mount St. Patrick mine in Renfrew county is another producing property. On the Central Ontario Division, not far from the Cordova Mines, there is a deposit, one near Maynooth, also on the I. B. & O. Branch near Wilberforce, west of Kinmount, and north of Westport in the township of North Crosby. A property has been developed northeast of Tamworth in Sheffield township where an operation has been carried on by the International Molybdenite Company. Small deposits exist in Foley township near Parry Sound. A deposit at Terrace Cove near Port Arthur is worthy of special mention, as it was the first deposit of the mineral found in Canada; specimens from it were sent by the Canadian Government to an Exhibition of the "Industry of all Nations" held in London, in 1851.

British Columbia:

Molybdenite is reported in the North Thompson and Fraser Valleys, but so far have not proved of commercial importance. There are other occurrences in British Columbia, but no great production is recorded.

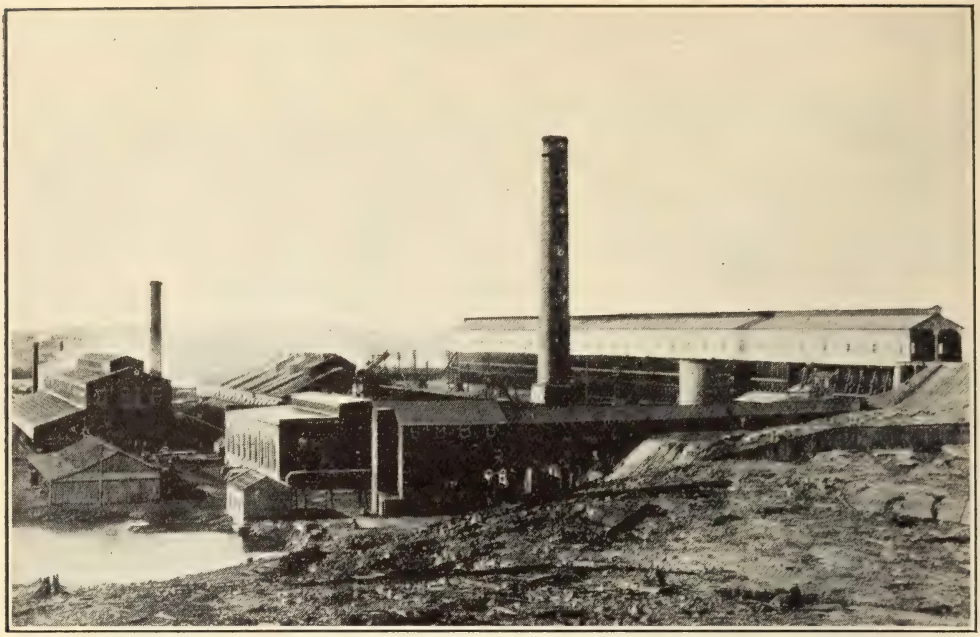
Bib.—Dom. Dept. Mines "Molybdenum", #592; GSC Summary Report 1917, Part "D" "Molybdenite near Falcon Lake, Man."; Can. Min. Journ. Vol. XXXVIII, No. 23, December 1917, "Molybdenite at Falcon Lake, Man."

NICKEL-COPPER

Important commercial deposits of nickel are found in the Sudbury district. Cobalt and Porcupine areas contribute to a minor extent. The Ontario mines supply over 85 per cent of the world's demand. Previous to 1919, a large proportion of the Canadian production of nickel entered into the manufacture of armaments; with the conclusion of the war and the general limitation of armament, this market was very largely cut off. The extension of the range of use of this metal due to research on the part of the companies interested, has resulted in marked increase in production and the wider utilization of nickel in steel alloys and household utensils. In 1919, 10,202,308 lbs. constituted the output; in 1925, this had risen to 32,114,564 lbs., or more than three times in volume.

Ontario:

The rocks of the Sudbury nickel area are pre-Cambrian in age. The dominant structural feature is what is termed the "Sudbury Basin". The ore deposits, consisting largely of pyrrhotite, chalcopyrite and pentlandite, are found on the outside of the Sudbury basin and usually in the vicinity of the contact of the "norite-micropegmatite" with the rock on the outside of the basin. Owing to this fact and since the Keeweenawan intrusion forms a range of hills around

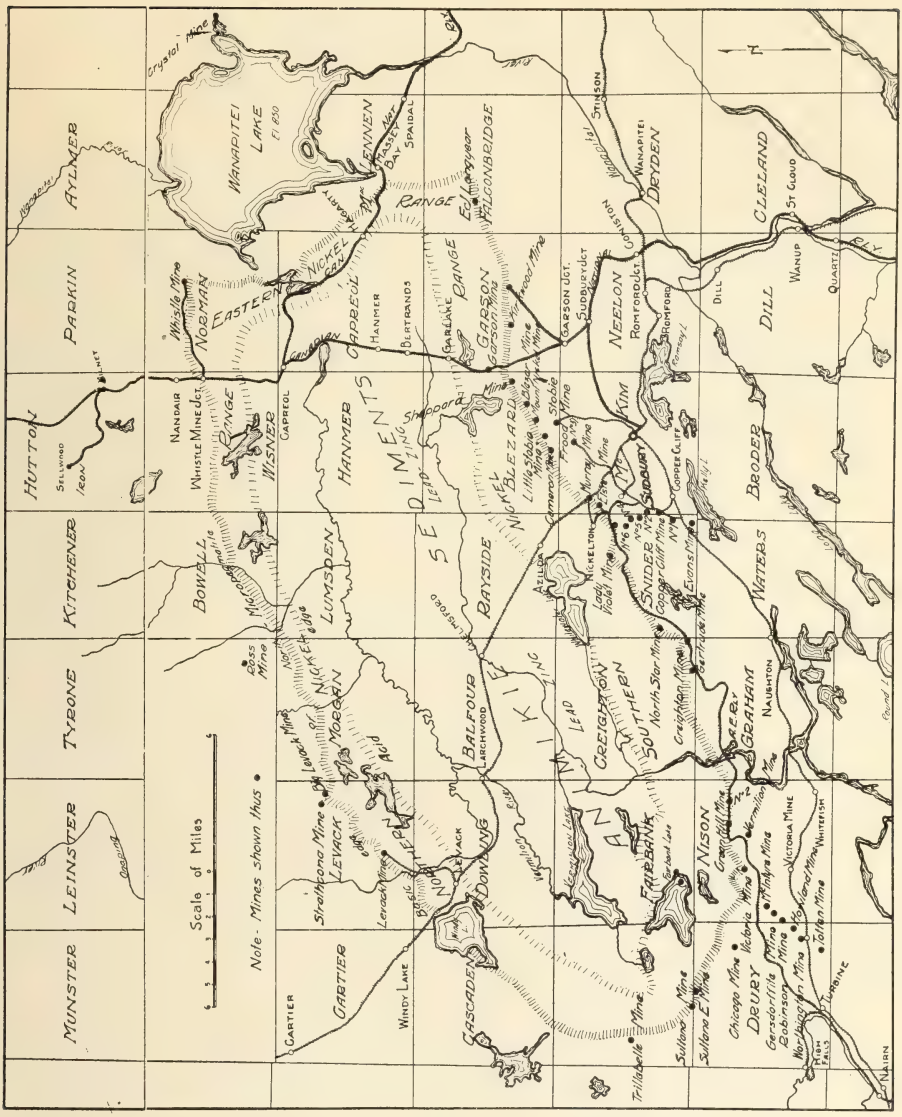


Mond Nickel Smelter, Coniston, Ont.

the drift-covered area of animikie sediments, the phrase "nickel range" has been used to designate the norite-micropegmatite in the different parts of the district.

The deposits are much more extensive and offer better facilities for the production of nickel at low cost than those of any other country. The producing companies are the International Nickel Company of Canada, operating a smelter at Copper Cliff, capacity 2,200 tons daily and refinery at Port Colborne; and the Mond Nickel Company, with a smelter at Coniston, with a capacity of 1,400 tons daily, the matte from which is shipped to Mond Nickel Company's refinery in Wales. At their works in Port Colborne, the International Nickel Company are producing a high grade of electrolitic nickel, a product which has a purity of 99.9 per cent. The purity of this product and its freedom from carbon and sulphur, make it applicable to special requirements in the production of certain high nickel content alloys.

The main ore bodies are the Crighton, Murray, Blezard, Frood, Garson, Stobie, Copper Cliff Offsets, Victoria Upper and Lower, Vermillion, Worthington and Crean Hill. These properties, during 1901-1926, produced ore to the value of over $400 million. In addition to nickel and copper these ores also contain the precious metals of the platinum group including platinum, palladium, rhodium, ruthenium, iridium, and osmium. While the quantities are minute in the crude ore they become concentrated appreciably in the matte. In 1925, a recovery of these precious metals was made to the extent of over a million and a half dollars. Development at the Frood Mine by the International Nickel Company has revealed enormous ore bodies carrying high values in copper. It is one of the most outstanding discoveries in the mineral history of the province.



LOCATION OF MINES AND OUTLINE OF THE NORITE - MICROPEGMATITE INTRUSIVE SUDBURY ONTARIO

In Cobalt, niccolite and smaltite occur either alone or associated with other less important nickel-bearing minerals in the veins in which the native silver and silver-bearing minerals are found. Between 1912 and 1917 nickel ore was produced at the Alexo mine in Porcupine district and shipped to the smelter at Coniston.

Near Shebandowan Lake, about five miles from the Canadian National Railways, there has recently been discovered an occurrence of nickel-copper ore carrying high values in precious metals, particularly those of the platinum group. This deposit is situated at the southwest end of Lower Shebandowan Lake about five miles from the Canadian National Railways, reached from Rossmere. A number of claims have been located on the strike of the ore body. The Keewatin in the vicinity of the copper-nickel deposit, is a dark green basic

schist, dipping at a steep angle, the strike following approximately the contact with the granite. Dykes of serpentine granite porphyry also follow the contact and the ore occurs in the vicinity of these dykes.

Manitoba:

Nickel-copper deposits have been discovered on the Oiseau River and the Maskwa River, some eight miles to the north in the vicinity of the Winnipeg River. This belt is in the noritic rocks; the principal mineralization is chalcopyrite and pyrrhotite with copper and nickel values. The commercial value of these deposits cannot be determined until further development has taken place.

Bib.—GSC Summary Report 1920, Part "C", "The Maskwa River Copper-Nickel deposit, Southeastern Manitoba"; 1921 Part "C", "Rice Lake and Oiseau River areas, Man."; 1922, Part "D", "Nickel Deposit at Shebandowan Lake, Thunder Bay District, Ont."; GSC, "Nickel and Copper Deposits of the Subdury Mining District, #961; Dom. Dept. Mines, "The Nickel Industry, with special reference to the Sudbury Region, #170; Ontario Dept. Mines' reports; Royal Ontario Nickel Commission Reports.

SILVER

The production of silver in Canada has so far been confined to the provinces of Ontario and British Columbia, though in Quebec a silver mine at Ville Marie, on Lake Temiskaming, now the Wright mine, was mentioned by Champlain and was shown in a map published in 1754 as Ance à la Mine.

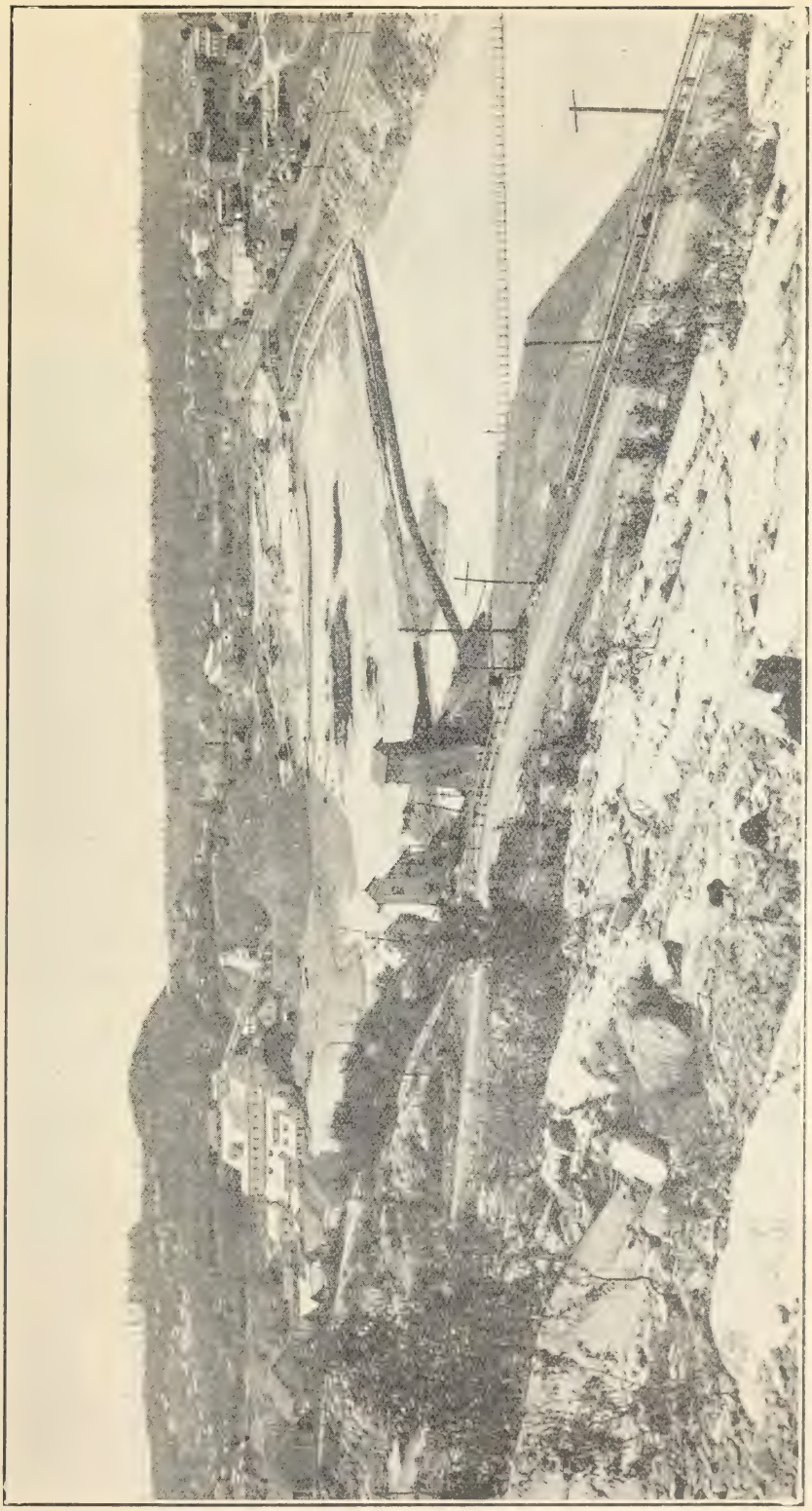
Ontario:

The first discovery of silver in Ontario was made in 1866, at, what afterwards became, the Thunder Bay Mine. In 1866, the celebrated mine at Silver Islet, near Thunder Cape, was discovered. This occurrence is described by Sir Wm. Logan, where it crossed Burnt Island, as "a very prominent lode, holding galena and green carbonate of copper." This property was worked for a number of years, but eventually water made the cost of operation excessive, and it was abandoned. Work on the property was resumed in recent years and again abandoned.

Up to the end of 1926, the silver camps of Ontario had paid $94 million in dividends and it is a notable fact that the money returned from Cobalt camp to the principal operators and shareholders furnished the capital that developed Porcupine, Kirkland Lake and is today the great factor in the development of many of the potential mines in Northwestern Quebec.

Cobalt.—Cobalt silver camp is known the world over and those interested in mining know its history and its principal mines. It is situated on the T. & N. O. Railway over which the transcontinental trains of the Canadian National Railways are operated. Cobalt camp had produced over $234 million in value up to the end of 1926; the production was from a comparatively small area, the values being found in pre-Cambrian rocks belonging to the Huronian and Keewatin, into which the diabase had intruded.

Production of silver in South Lorrain commenced in 1908. This camp is situated 18 miles south-east of Cobalt near Lake Temiskaming and connected with Cobalt by the T. & N. O. Railway and a good highway. Its production to the end of 1926 was over 16 million ounces. In South Lorrain, the principal

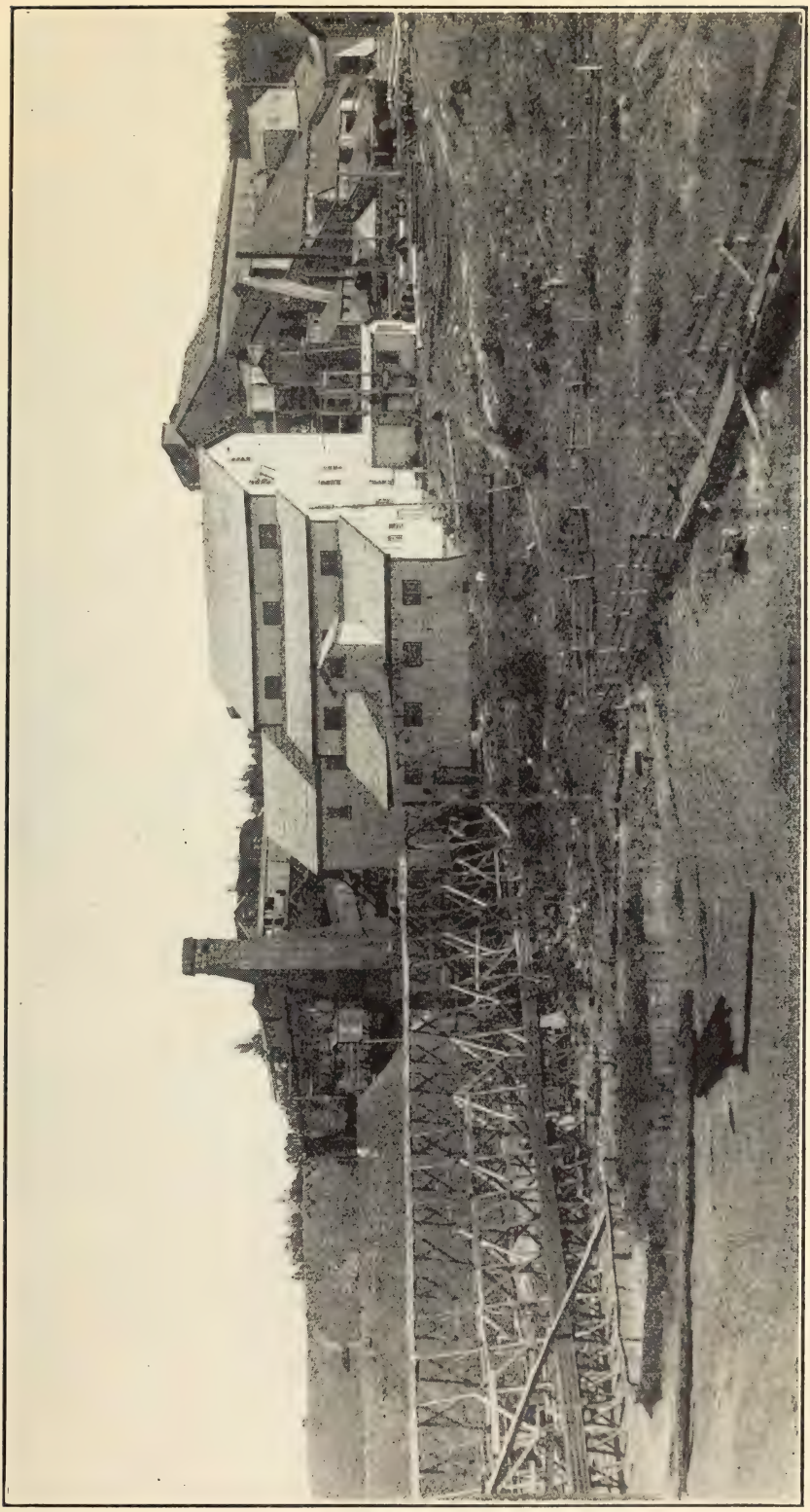


Cobalt, Ont.

SILVER PRODUCTION OF THE WORLD (a)

(In fine ounces)

	1917	1918	1919	1920	1921	1922	1923	1924	1925
NORTH AMERICA:									
United States	71,740,400	67,810,100	56,682,445	55,361,573	53,052,441	56,240,048	66,163,338	64,221,655	61,377,977
Canada	22,221,300	21,383,979	16,020,657	13,330,357	13,543,198	18,626,439	18,601,744	19,736,323	20,003,970
Mexico	42,019,664	62,517,000	65,904,224	66,516,354	64,465,347	81,076,899	90,810,855	91,437,944	92,885,176
Total, North America	**135,981,364**	**151,711,079**	**138,607,326**	**135,208,284**	**131,060,986**	**155,943,386**	**175,575,937**	**175,395,922**	**174,267,123**
Central America and West Indies	**2,369,500**	**2,900,000**	**2,800,000**	**2,700,000**	**2,000,000**	**2,500,000**	**3,000,000**	**3,000,000**	**3,000,000**
SOUTH AMERICA:									
Argentina	29,000	25,000	25,000	30,000	25,000	25,000	.....	.....	.....
Bolivia and Chile	4,151,600	4,335,000	4,335,000	4,828,086	5,000,000	8,082,700	8,550,317	7,892,469	8,500,000
Brazil	25,000	25,000	25,000	30,000	33,000	25,720	28,613	28,613	*30,000
Colombia	325,000	494,331	494,331	480,000	500,000	3,150	3,150	2,900	*3,000
Ecuador	45,000	40,000	40,000	35,000	75,000	75,000	75,000	70,000	*70,000
Peru	10,864,400	9,781,734	9,821,729	9,196,282	9,853,910	13,169,765	18,654,362	18,800,000	21,253,000
Other countries	11,300	11,000	12,100	12,000	13,700	16,850	11,200	11,400	*11,000
Total, South America	**15,451,300**	**14,712,065**	**14,753,160**	**14,611,368**	**15,500,610**	**21,398,185**	**27,322,642**	**26,805,382**	**29,867,000**
EUROPE:									
Austria-Hungary	1,500,000	1,750,000	15,432	13,985	15,000	8,583	14,178	28,678	.....
France	384,835	272,278	164,222	321,500	392,873	347,220	213,025	147,858	.....
Czechoslovakia	.....	554,780	580,918	680,069	703,056	875,187	702,317	732,538	.....
Great Britain	75,500	79,636	68,415	76,344	12,229	29,885	34,625	33,688	.....
Germany (including Silesia)	5,404,415	5,259,740	3,475,415	3,305,020	3,387,420	3,615,525	3,883,945	4,787,521	.....
Greece	350,000	175,015	160,000	220,935	192,900	184,123	195,000	160,750	.....
Italy	486,500	500,000	300,000	297,452	219,392	215,405	385,806	427,595	.....
Norway	292,516	312,016	341,433	323,172	202,115	205,760	298,995	424,380	.....
Rumania	.....	.....	.....	.....	96,450	62,821	64,300	72,209	.....
Russia	500,000	400,000	400,000	50,000	40,000	150,000	192,900	200,000	.....
Serbia	20,000	20,000	20,000	15,000	15,946	26,813	24,562	31,250	.....
Spain and Portugal	3,676,095	3,182,464	2,666,232	2,956,546	2,679,349	2,778,210	2,842,060	2,879,965	.....
Sweden	57,356	31,500	20,576	22,569	13,342	9,645	15,046	60,667	.....
Turkey	400,000	400,000	100,000	100,000	100,000	8,037	8,037	219,906	.....
Total, Europe	**13,147,217**	**12,937,429**	**8,312,643**	**8,382,592**	**8,070,072**	**8,517,214**	**8,874,796**	**10,207,005**	***10,500,000**
OCEANIA:									
New South Wales	8,545,979	9,259,961	6,304,818	675,332	4,241,890	9,912,927	12,067,954	9,256,671	.....
Queensland	241,639	152,499	92,048	274,235	195,328	273,036	469,302	276,651	.....
Victoria	7,669	6,333	6,121	6,231	5,204	6,978	6,304	4,216	.....
New Zealand	787,152	879,383	453,561	454,000	454,000	376,000	527,491	470,472	.....
Tasmania	284,510	294,396	525,343	623,359	348,658	794,585	638,602	642,158	.....
Other States	223,900	111,438	223,893	131,697	117,600	121,208	109,048	89,146	.....
Total Oceania	**10,090,849**	**10,704,010**	**7,605,784**	**2,164,854**	**5,362,680**	**11,484,734**	**13,818,701**	**10,739,314**	**11,100,000**
ASIA:									
India	1,581,838	1,971,783	2,165,606	2,906,397	3,587,587	4,244,304	4,863,066	5,309,203	5,200,000
China	63,400	70,000	65,000	50,000	40,000	100,000	100,000	110,000	*100,000
Chosen (Korea)	26,500	26,000	20,000	1,200	2,958	10,835	39,281	50,000	*50,000
Dutch East Indies	400,000	1,286,000	1,006,842	1,027,956	1,021,994	1,109,657	1,408,973	2,083,256	*2,000,000
Japan	7,108,590	6,596,618	5,160,070	4,889,540	4,185,504	3,886,301	3,597,264	3,542,255	4,022,000
Other countries	40,600	27,900	32,269	25,179	29,962	23,890	23,437	11,008	*10,000
Total Asia	**9,220,928**	**9,978,301**	**8,449,787**	**8,900,272**	**8,868,005**	**9,374,987**	**10,032,021**	**11,105,722**	**11,382,000**
AFRICA:									
Algeria	.....	170,813	170,813	150,000	.....	.....	.....	.....	.....
Belgian Congo	10,300	10,500	10,000	10,674	5,819	6,559	8,745	.....	.....
Rhodesia	212,000	175,722	180,591	164,865	161,383	179,399	161,492	401,277	157,971
Trasvaal, Cape Colony and Natal	938,100	877,500	891,304	892,593	830,329	1,115,676	1,373,930	1,396,943	1,300,000
Other countries	22,100	21,980	18,986	15,116	13,362	13,362	1,000	733	*1,000
Total Africa	**1,182,500**	**1,256,515**	**1,271,694**	**1,233,948**	**1,010,893**	**1,314,996**	**1,545,167**	**1,798,953**	**1,458,971**
Total for World	**187,443,658**	**204,199,399**	**181,800,394**	**173,200,618**	**171,873,246**	**210,533,502**	**240,169,264**	**239,052,298**	**241,575,094**

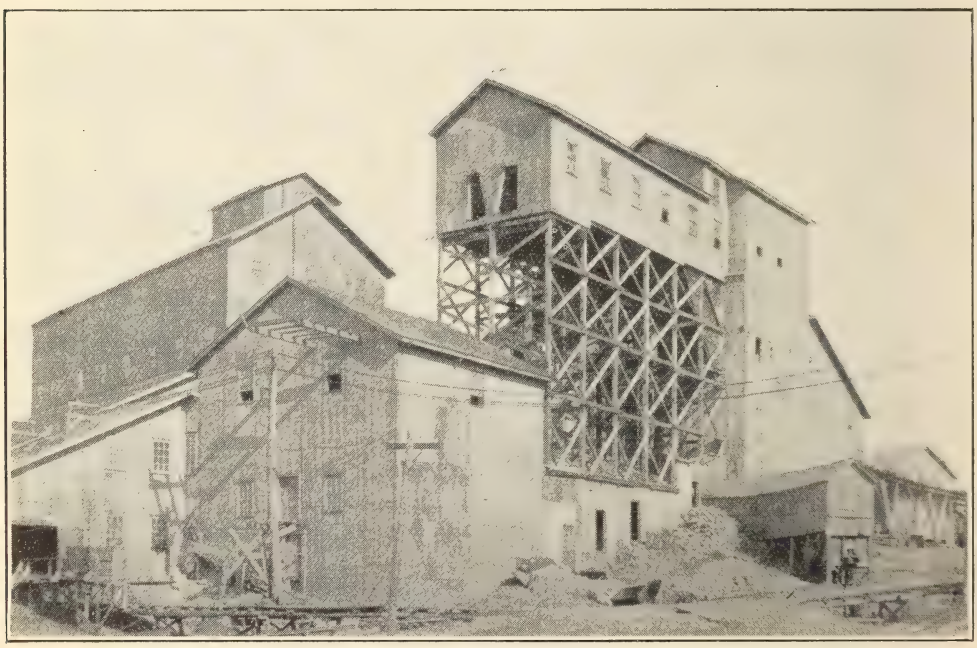


McKinley Darragh, Cobalt, Ont.

vein known as the "Woods vein" is situated on a fault contact, the ore shoots being shorter, but wider than Cobalt. Other faults occur in this area and there is little doubt that there are opportunities for further discovery on the many undeveloped c'aims.

As pointed out by the Ontario Department of Mines, the history of this camp illustrates the ups and downs of mining. Discoveries of high-grade silver ore had been made in 1907, following which the Wettlaufer, Keeley, Frontier and other mines were opened up. The Keeley, after producing over 24,000 oz. of silver was closed, the opinion being that the mine was worked out. Several years later, however, Dr. J. MacKintosh Bell, as a result of development work carried on for the "Huronian Belt," revealed a veritable treasure chamber on this mine, ore being discovered in quantity and equal in grade to the best that Cobalt had produced in the early days.

Gowgando.— Silver-bearing veins have been found in widely separated areas from Cobalt westward to Shining Tree. Of the outlying areas, Gowganda has proved the most important.



Nipissing Silver Mine, Cobalt, Ont.

The main production from this camp, which was discovered in 1908, has come from properties lying north-west of Miller Lake. Shipments have, however, been made from west of Gowganda Lake from the Reeve-Dobie, Mann and Andrews-McFarlan (formerly the Bartlett). Nearly all the deposits are in the Nipissing diabase which occurs in a number of townships surrounding Gowganda Lake. From 1910 to 1912, the Millerette Mine, since worked out, was the main producer, the ore coming chiefly from a shoot in the conglomerate which produced 500,000 oz. of silver. The Miller Lake-O'Brien has operated con-

tinuously from 1909 and the workings of this property are all in the diabase still; the Castle-Trethewey—where the main shaft is now down 700 feet—commenced shipping in 1920; and the Tonopah, which is operating the Walsh and Morrison properties, has also met with success. Other properties are the W. J. 9; the Gardner-Johnson-Hylands; the Capitol; Milner; Wigwam; Everett; Keora; and Haultain.

Silver Shipment, Cobalt, Ont.

While the Miller Lake-O'Brien mine constructed for its own use a 500 horsepower plant and the Castle-Trethewey has utilized the power from a small development of the South Bay Power Company, the area has been handicapped by insufficient power. The Northern Canada Power Company's transmission line has now been extended to Gowganda and will undoubtedly result in increased output and more rapid development.

British Columbia:

In the country served by, and contiguous to the Canadian National Railways, there are operating mines, and a large number of encouraging prospects. The operating properties are mainly located in the Portland Canal and Omineca Mining Divisions. In the Portland Canal mining district active operations are being carried on on the Salmon, Bear and Marmot Rivers; the Skeena, Alice Arm district; on the Kitsault and Nass Rivers; and Omineca district on Hudson Bay Mountain; Nine-Mile Mountain; Glen Mountain and the Babine area.

The Salmon River area is situated about fourteen miles north of the head of the Portland Canal. The values in mines of this area have been mainly silver, although the reports of the Geological Survey and the B.C. Department of

Mines show that many of the deposits carry economic quantities of galena, zinc blende, chalcopyrite and pyrite in a quartz gangue, which constitutes what is known as a complex siliceous ore.

Large quantities of ore, yielding returns in silver, zinc, lead and gold, are mined in the older sections of B.C., in that part of the Province served by the Canadian Pacific Railway and the smelter at Trail. Notable camps are Nelson, Greenwood, Kimberley, Slocan, Ainsworth, Arrow Lake, Trout Lake, Lardeau, Windermere and Fort Steele.

The Eureka Mine is situated five and a half miles south of Hope, B.C., the oldest mine in the area, having been discovered in 1871. It is considered a high-grade silver property. The Van Brenner, another property, is situated a short distance south of the Eureka. Those properties, reached by an old trail which comes out at the railway station between Hope and Floods Station, were reopened in 1925. The results of the examination were very encouraging and there is every prospect that they will again become producing mines.

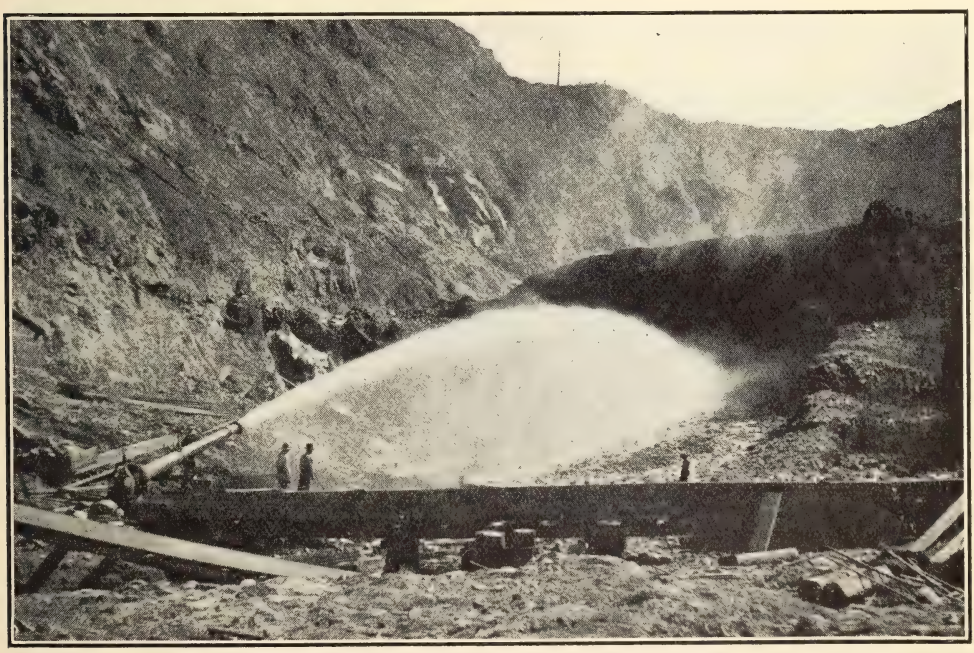
Kamloops Area.—Since the opening of the former Canadian Northern Railway line, this area of the Kamloops Division has attracted many prospectors. Encouraging results have accompanied the development and active work is proceeding in the Louis Creek, Barriere River, Chu Chua, Birch Island, Vavenby and the Clearwater Valley districts. The Homestake Mine, Adams Lake, where a silver property has taken on a new lease of life and shows great promise, has stimulated prospecting in that area. In the Chu Chua area, the more important properties are the Windpass, Gold Hill and Red Top group. The satisfactory results at the Windpass have rendered the camp of great interest to prospectors. The B.C. Department of Mines describes the geological conditions briefly: "There is a granite intrusion in the district the core of which is Mount Baldie, lying a little east of Chu Chua, on the North Thompson River and the Canadian National Railways. The veins so far discovered are in other rocks on the western contact of the granite. These rocks are diorite adjoining the granite and next to it a greenstone called by Dr. Uglow the 'Fennell Greenstone'." The Windpass group veins are in the diorite. On another group in the area—the Gold Hill—where some vein systems have been located in the greenstone, the values, however, are mainly gold. The operators of the Windpass propose building a mill near Boulder station on the Canadian National Railways.

In the Birch Island area there are some attractive properties and considerable activity is in evidence on Fog Horn Creek, which empties into the North Thompson River from the south at Birch Island on the Canadian National Railways. Two properties of promise are the Lydia Mine, situated eight miles up Fog Horn Creek, carrying copper values, and the Minnesota Girl, where development is proceeding on a large low-grade lead-zinc ore body. The Smuggler group, two miles from the railway—a group of silver-lead properties—is giving encouraging results, and the same can be said of the Shamrock group. In the Vavenby area the Sunrise group has an encouraging showing of gold, also the Noble group, two miles northwest of the Sunrise, a galena deposit.

The area that is most likely to attract attention in the near future, but about which very little is known at present, is situated in the angle formed by the the former Canadian Northern Railway and the Grand Trunk Pacific line lying west of Albreda and south of Tete Jaune Cache. It is believed that some really big mines will be developed in this district. One group of claims has showings of great magnitude, carrying high values in silver; some of the ore also carries copper-gold. One of the lodes is estimated to be 22 feet wide with stringers of from two to five feet wide, thrown out in a northwesterly direction. This property shows every indication of making one of the big mines of British Columbia.

Usk.—Near Usk, the Silver Basin group of properties is situated at the head of Chimdemash Creek. The ore-bearing veins follow fissures in volcanic flows of rhyolite and trachite. The ore seams exposed so far are not wide but the width of the fissures are from five to six feet. The veins are well-defined and persistent in length, the prevailing ore is a grey copper of high silver content. Considerable development has been carried on in this group which may be regarded as very promising prospects. In the same vicinity, on the east side of the Skeena River, the Vanmeter claim, called the Silver Bow, has uncovered some very rich ore, carrying high values in silver and lead, also about $9.00 in gold. This discovery has proved a great incentive to prospectors who have done much work in the immediate vicinity.

Hazelton.—This is an important centre of mining activity particularly in the Rocher DeBoule and Silver Cup sections, which include, in addition to the Rocher DeBoule mine, the New Hazelton Gold Cobalt, the Silver Standard, and Sunrise.



Placer Mining, Cariboo District, B. C.

Pack Train, Hazelton, B. C.

The Silver Standard mine on Glen Mountain, six miles from New Hazelton, was one of the earliest mines worked in the district. Development work was carried on from 1910, and in 1918 a fifty-ton concentrator was erected and shipments of silver-lead and silver-zinc concentrates were made. Unfortunately, the mill was not equipped with an oil flotation plant, which, in the light of present practice, is a matter of regret. For three years it operated steadily and a total recovery of 1100 oz. of gold, 625,000 oz. of silver, and two and a half million pounds of lead and zinc were recovered. Work is proceeding on the property. The Silver Cup and Sunrise groups have been worked for some years, high-grade silver-lead-zinc ore, similar to that found on the Silver Standard, having been shipped from time to time. The mine needs further development to determine its possibilities. The American Boy lies on the Bulkley slope and carries values in silver, also gold and copper.

Smithers.—This is the centre of an important mining area. It has a Branch of the B. C. Chamber of Mines, which has stimulated much activity in the district. The most important operating mine in this area is the Henderson claim on Hudson Bay Mountain, operated by the Duthie Mines. A truck road, fifteen miles in length, has been constructed from Smithers to this claim. Substantial shipments of high-grade silver ore have been made from this mine since 1924. The formation is characterized by highly altered flows of rhyolite, andesite and other volcanic rocks. The values have been found in the rhyolite. The metallic minerals present are galena, zinc-lead, and grey copper so rich in silver that it is classed as "freibergite". It is due to the presence of this mineral that the ore is of so high a grade. Small amounts of ruby silver and native silver can be observed in some of the veins. In 1926, the Henderson was shipping high-grade ore at the rate of ten tons a day to Smithers where the ore is sent by

rail to the Trail smelter. A concentrator has been installed on this property. Other properties in the immediate vicinity are the Victory group, situated a mile west of the Henderson; the King Tut, also the Silver Peak group on the northeastern slope of Hudson Bay Mountain.

The Schufer group lies on the northwest slope of Hudson Bay Mountain. It is under bond to the British Canadian Silver Corporation, who have extended a tunnel to cross-cut a vein which it reached in the summer of 1926. A large ore body is also exposed in an open cut. There are a number of other claims on the Hudson Bay Mountain, including the Mamie group, that look promising. The Harvey group, twelve miles from Smithers, is under development, a shaft having been sunk and a three hundred foot tunnel driven. The main values occur in grey copper, returning 42 oz. of silver to the ton and four per cent copper. Other promising mining areas, in the vicinity of Smithers, are Driftwood Creek, Grouse Mountain and Owen Lake.

Babine Range.—From Smithers there is a road to the Babine Range which makes the country easily accessible. In 1926 an important merger of claims took place in the Babine Range, negotiations being conducted by Messrs. Messener of New York and A. T. Harrer of Smithers. The groups included in the consolidation contain eighty-one mineral claims, on fifty of which there are known to be mineralized veins. The properties all lie near the summit of the Babine Range across the divide from the Bulkley drainage, and approximately nineteen miles from Smithers. It is proposed to construct a four-mile trail which will connect with the road from Smithers. The groups bonded are the Babine Silver King Mining Company, Highland Basin, Little Joe, Victoria, Four Lakes and Silver Saddle.

The Silver King has a main working tunnel near the shore of the Basin and from this cross-cutting has proceeded which has encountered ore bodies carrying good values. The Babine Silver King is well-known for its high-grade ore, its silver having won a first prize at an exhibition held in Vancouver. Test shipments have been made from the Silver King and Little Joe. On the Highland Basin group a number of veins have been exposed carrying high values in silver. Development in this section of the Babines indicates the existence of economic ore bodies of high-grade and should yield a generous return on capital investments.

The Babine Bonanza, which lies on the eastern slope of Turner Mountain, is reached by road, thirty miles from Telkwa. Much development work has been carried on on this property in the way of tunnels, cross-cuts and drifts to the extent of over 4000 feet, but the present status of the property would indicate that more work will have to be done to determine its commercial value. The most important ore body disclosed is in a contact between rhyolite and what may be termed a "black schist". The surrounding country, however, is most promising and presents an excellent opportunity for prospecting.

Topley.—Near Topley a most spectacular discovery was made in 1926 by a prospector named F. H. Taylor. The claims are situated at the base of Black Mountain, eight miles from Topley, at an elevation of 2,000 feet above the railway. A good road has been constructed, connecting with the Babine road. The ore was found to outcrop in a ravine and the occurrence has been declared

to be one of the most important finds made in British Columbia in recent years. At the discovery point, the occurrence is 150 feet wide and is exposed for over 400 feet. The strike is North 45° West and the bearing of the cross-cut North 45° East. Appearances indicate that the mineralization is a replacement following the bedding planes and is in a rhyolite formation in contact with an

Silver Standard Mine, East of Hazelton, B. C.

andesite dyke. The precious metals are silver and gold, chiefly associated with arsenic, pyrite and galena. Some of the ore assayed as high as 394 oz. silver to the ton. Other discoveries have been made in the immediate vicinity.

On the Cup mineral claims, six and one-half miles north of Topley and about one and a half miles from the Taylor claims at Richfield, some development work has been done. A sample shipment to Trail showed encouraging returns. The occurrence is described as a vein exposed 600 feet in length along the enclosing valley rim of a small unknown creek. The vein is from three to six feet wide and is mineralized with galena, zinc blende and pyrite, in a siliceous gangue.

It will be readily seen by the foregoing on silver, in the area under consideration, that the great need of this country is capital and, judging by the interest that the Red Top claims have aroused and the number of representatives of the big mining groups that have examined this discovery, it should have the effect of indicating to the mining world the great possibilities in Central British Columbia.

Burns Lake.—The Mona, Cymric, Celtic group of twelve claims, ten miles from Burns Station, are extremely promising properties; a mineralized zone runs through the three groups. Assays show high values in silver. One of the owners points out that on the Mona, work indicates that "the ore is in place in large quantities, the parallel veins running through the three groups".

Portland Canal.—The main silver-producing property of British Columbia at the present time is the Premier Mine, Salmon River, Portland Canal Division, which has produced as high as three million ounces in one year. In 1904, prospectors from the Bear River Valley crossed the divide into the country at the head of Salmon River and staked the big Missouri claims, which have an enormous outcropping of mineralized rock; this was followed by an influx of prospectors who did a large amount of staking. Up to 1917, the district was considered to be one of large deposits of low-grade complex ore. During that year very high-grade silver ore was found upon several properties and the district is now regarded as a high-grade camp, as well as a possible low-grade one on a very large scale. The primary high-grade silver ores are mainly found in quartz veins of silicified shear zones about the borders of the granodiorite-porphyry intrusive.

Mention may be made of discoveries of silver-lead deposits of great promise in the Keno Hill area, Mayo district, Yukon. Mayo is situated on Upper Stewart River, 180 miles above its confluence with the Yukon. Keno Ridge, 42 miles from Mayo by wagon-road, is an elevation about 10 miles long and 5 miles wide, lying between Christal and Lightning Creek and Ladue River. A large number of claims have been staked in the district and there are several important operating companies.

Bib.—GSC "Amisk-Athapapuskow Lake District, Man." #105; GSC Summary Reports 1917, Part "B"; 1922, Part "A"; 1920, Part "A"; 1921 Part "D". B.C. Dept. Mines' Reports; Ont. Dept. Mines' Reports; Ont. Dept. Mines' "Report on South Lorrain Silver-Area".

TITANIUM

Titaniferous ores of economic value are found in Canada. The three titanium-bearing minerals that may be classed as ores of this metal are ilmenite, titaniferous magnetite and rutile. The known deposits are large and sufficiently rich to be of commercial importance.

A white titanium pigment can be produced from these ores. This pigment, which is coming into common use, is fast displacing the zinc and lead whites. The qualities claimed for it are greater covering power than white lead or zinc oxide, and that it is chemically inactive with vehicles or other pigments. It is not affected by acid fumes or sulphur gasses and remains white under any atmospheric conditions and is non-toxic. Due to its cost of production it is diluted with barium sulphate for commercial use. The titanium can be separated from any iron present by fusing with acid sulphate of soda, and by pouring the metal into a large quantity of water. Experiments have been conducted in England for the production of colours other than white. The iron can be recovered as an oxide by precipitation with lime or soda, converted into a chloride and recovered as electrolytic iron of absolute purity, remarkable for its ductility.

Quebec:

There are large accessible deposits of ilmenite carrying from 20 to 25 per cent titanium north of Baie St. Paul in Charlebois county and at Ivry, 67 miles north of Montreal in Terrebonne county. The only commercial deposit of rutile in Canada also occurs in this Province in the parish of St. Urbain, where it is found disseminated through parts of some of the large masses of ilmenite

that have been worked there. At the present time, this is the only deposit of rutile known in Canada.

A body of titaniferous magnetite is found on the Saguenay River near Lake St. John in Chicoutimi county and another body exists at the Bay of the Seven Islands, on the lower St. Lawrence in Saguenay county. As pointed out by the Department of Mines, these titaniferous magnetites are, on the whole, too low in titanium in their natural state to compete with the richer ilmenites as titanium ore. However, experiments in their magnetic concentration would indicate the possibility of obtaining from some of them at least, a concentrate having a high titanium content.

Ontario:

Deposits of any magnitude found in this Province consist of titaniferous magnetites carrying from 5 to 25% titanium. Among these may be mentioned deposits in the vicinity of Seine Bay, Rainy Lake, in the Rainy River district.

Bib.—Dom. Dept. Mines "Titanium", # 579; Dom. Mines Dept. Investigations of Mineral Resources and the Mining Industry, 1924; "Titaniferous magnetite deposits of Bourget Township, Chicoutimi district, Quebec". # 670 Dom. Dept. of Mines, Mines Branch Report # 239 electrolytic recovery of iron from ilmenite.

TUNGSTEN

This metal is mainly used in the manufacture of armour plate and projectiles, high speed and other forms of steel; it is also used as an element in electric light filaments, and in fire-proofing textile fabrics. It has been found that the addition of tungsten plus vanadium up to 0.5 and 0.25 per cent of each improved the mechanical properties of cast iron containing 1.75 per cent silicon. China produces more than half the world's supply; India, Japan and the Malay States are also producers. Due to the cheap Asiatic production there has been no Canadian production for some years.

Nova Scotia:

Ores of tungsten have been discovered at Moose River and other places in Halifax County, at New Ross, in Lunenburg County, and in Queen's County. The Halifax County deposits are in gold-bearing rock. The deposits at Moose River, in the form of "scheelite," are of some importance; the width of the vein varies from a fraction of an inch to 24 inches, the average width is over 4 inches.

New Brunswick:

Some development work has been carried on at Burnt Hill Brook, York County, where it occurs as wolframite in a milky quartz both in massive and crystalline form. In 1917, a considerable quantity of ore was mined and concentrated. The vein is about four feet thick.

Quebec:

Tungsten is found as "scheelite" in quartz veins in Beauce County.

Manitoba:

Small quantities have been found in Southeastern Manitoba, near the Ontario boundary.

British Columbia:

Tungsten has been noted in quartz veins along the Clearwater River, also at Hardscrabble Creek in the Cariboo district.

Bib.—GSC Summary Report 1916, "Wolframite", New Brunswick, pages 247-248-251-2-3-4; "Scheelite", Nova Scotia, 249-250-251; GSC 1915 Canadian occurrences; GSC "Geology and Economic Minerals of Canada", # 2160.

NON-METALLIC MINERALS

ACTINOLITE

Actinolite, a fibrous magnesium silicate, occurs in a number of places in Canada, but has only been mined for commercial purposes in the Province of Ontario.

When combined with tar and other ingredients it makes most excellent roofing, being weather resisting and immune to the effects of acids in the atmosphere. It has very long life as a roofing material; a number of roofs in Chicago made of actinolite from Ontario, have been in existence for over thirty-five years, and show little sign of deterioration. This roofing is also more or less a non-conductor of heat and cold.

Ontario:

A belt of crescent form, composed of fibrous magnesium silicates,including actinolite, tremolite, fibrous hornblende and mixtures of these with talc and soapstone, stretches from Bannockburn through Actinolite in Hastings county, to the vicinity of Flinton, in the counties of Lennox and Addington. Production of this mineral has been confined to Elzevir and Kaladir townships in Hastings and Addington counties, the place known as Actinolite being the only active centre. Production has been intermittent in recent years.

Bib.—Ont. Dept. Mines Report 1904, Vol. XIII, Part I, "Actinolite in Hastings County"; and "Actinolite near Actinolite".

ASBESTOS

Asbestos, generally found in Canada, is, the chrysotile or serpentine variety. It is of very fine quality, soft and silky in texture. The important attributes of this mineral are its fibrous structure, tensile strength and resistance to heat. As it is non-combustible, it is used as a protection from fire and also to conserve heat by preventing radiation. Canada is the leading producer of this mineral, supplying the largest part of the world's requirements though, in recent years South Africa has become an active competitor.

Quebec:

The principal deposits are located in the Eastern Townships in a range of serpentine rocks, which stretch through the townships of Broughton, Thetford, Coleraine, and Shipton. Some scattered deposits are also found in the townships of Wolfstown and Ireland.

The Canadian Johns-Manville Company operates a mine at Asbestos near Danville, P.Q., where the highest grade is produced. Situated adjacent to the

mine is their large factory covering four and a half acres of ground where the raw material is converted into practically all the products of asbestos manufactured; including insulating materials, roofing, packing, brake lining and asbestos clutch facings for the automotive trade. Other occurrences noted are, Asbestos Island, Abitibi District, Ottawa County and Richmond County near Brompton.

Ontario:

Several deposits of minor importance have been found in Northern Ontario, but no production has been recorded since 1917, when the output was a little over $2,000 in value.

In the township of Loughborough, Frontenac County, there is an occurrence in the vicinity of Knowlton Lake, where fibres have been noted from one to three inches in length, in the serpentine which outcrops in the limestone.

Manitoba:

Deposits have recently been discovered in The Pas mineral belt — Grassy River at the south end of Elbow Lake.

Bib.—GSC Summary Reports 1909, 1910; GSC "Report on the Chibougamau Mining Region in the Northern Part of the Province of Quebec, #923; Dom. Dept. Mines "Chrysotile-Asbestos", #69.

BARYTES

Barium is found in Canada in the form of barytes or barium sulphate sometimes termed "heavy spar". These deposits occur as veins, some of them carrying white barytes of purity and in others associated with calcite.

The barium chemicals cover a wide range of use; they enter into the preparation of oxygen and the manufacture of hydrogen peroxide and in the making of bleaches. Barium carbonate is used in the brick industry in the finishing process; barium chlorate in pyrotechnics, and other purposes.

Deposits of barytes (sulphate of barium) are found in Northeastern Nova Scotia, also in Ontario. The chief use for this mineral is in the making of lithopone, blanc fixe, barium chemicals, and as ground and refined barytes. The deposits in Canada have not been extensively worked, but there would appear to be a good market for the higher grades. While England has fairly large deposits, before the war most of her barytes and barium products were imported from Germany. Lithopone is a valuable pigment manufactured from barytes. It is largely used as a flat wall paint for interior work, being equal if not superior to zinc oxide for this purpose, also as an important component part of other paints. It is also used as a filler for rubber.

Nova Scotia:

Deposits in this Province are widely distributed throughout the northeastern portion of the Province. Operations have been carried on at Five Islands, Colchester County, and Lake Ainslie, Inverness County, where shipment is made from Strathlorn Station to Halifax for grinding.

Ontario:

The largest deposit of barytes so far found in this Province is near Tionaga Station, in the township of Penhorwood, north of Sudbury, where a vein of some

seven feet in width has been opened up with a surface exposure of over 500 feet in length. There is also a deposit near Night Hawk Lake, adjacent to the T. & N. O. Railway, and others in Yarrow, Lawson and Langmuir townships.

Quebec:

Deposits are known in Hull, Labelle and Pontiac counties, but no active mining has been carried on.

Bib.—Dom. Dept. Mines "Barium & Strontium", #570; GSC "Barytes Deposits of Lake Ainslie and North Cheticamp, N.S."; Ont. Dept. Mines' Reports Vol. XXVII, Part I, 1918; Vol. XXX, Part I, 1921.

BENTONITE

Bentonite was first observed in the Benton formation at Rock Creek, Wyoming, hence its name. It has been described as a "colloidal clay" and occurs as a bedded sediment in deposits varying from a few inches up to ten feet in thickness and is found chiefly in horizons of the Upper Cretaceous rocks in Western Canada. Occurrences in several localities in Manitoba, Saskatchewan, Alberta and British Columbia have been investigated by the Mines Branch of the Dominion Department of Mines and, from their investigations, it is concluded that it may be widely distributed over a considerable area in Southern Saskatchewan and Alberta. It is probable that the sticky character of the Prairie gumbo soils is due to the presence in them of bentonite.

Up to the present time, the established field of usefulness of the material in industry is a limited one. As the Department of Mines points out, the progress and development of uses for bentonite have been slow for various reasons. In the first place, the deposits are situated a considerable distance from industrial centres; further, most crude bentonite contains a considerable amount of impurities in the form of sand, gypsum needles or crystals carrying carbonaceous matter, etc., which makes it necessary to refine the clay before it is suitable for a majority of uses. Due to its colloidal character it is not a simple matter to clean the clay economically and while this presents no actual physical difficulty it is expensive, owing to the extensive amount of water absorbed by the clay and the consequent cost of drying.

Experimental work in the Ceramic Division of the Mines Branch, Dominion Department of Mines, has shown that bentonite can be used to advantage in the enamel of agate wear; also as a means of cutting down the amount of bonding clay used in electrical and chemical porcelain. "It has also been shown that the addition of a small percentage of bentonite to short ceramic bodies renders them plastic and interest is being shown in the use of bentonite as a plasticizing agent".

Owing to its absorbative power and affinity for water it is a most useful de-watering agent and suggests itself particularly as a means of removing water from petroleum, gasoline and oils of various kinds; such clays have been used successfully for cleaning heavy lubricating oils, kerosene and gasoline. In gypsum and lime plasters tests indicate that it is useful in increasing the mechanical strength of the set material; it has been stated that it acts as a retarding agent in gypsum plaster.

A use suggested is in the preparation of emulsions of various types, a small amount of it acting both as an accelerator and as a stabilizer in emulsions composed of water and various oils, fats and resins. While this is a field that has not been actively investigated, it would appear to present great possibilities and opportunities for research. A further extension of this field would be in the emulsifying of asphalt, coal tar residues and pitch. It has been proposed as an absorbent of nitro-glycerine in the manufacture of dynamite.

Other applications include its possible use in the loading or filling of paper, textiles and other fabrics; in the manufacture of rubber and paints; in foundry work; as an ingredient of core washes; in horticultural sprays and animal dips. Bentonite is the base used in many of the facial clay packs; it also has an application in other cosmetics and pharmaceuticals, also scouring compounds.

Manitoba:

The Department of Mines records the observation of bentonite beds up to 24″ in thickness on the main branch of Favel River (tp. 36, range 26, W. 1st meridian); on Ochre River (tp. 24, range 17, W. 1st. mer.); and on Sclater River (tp. 34, range 23, W. 1st mer.) A. MacLean notes (G.S.C. Sum. Report 1914, page 70) about 50 feet of "waxy, tenacious clay, probably consisting largely of colloidal material, very similar to bentonite" in Dead Horse Valley, Pembina Mountains, from the international boundary to E. ½ sec. 23, tp. 2, range 9, W. 1st mer.

Saskatchewan:

Mr. S. C. Ells of the Department of Mines mentions the occurrence of beds 5 to 24″ thick and ranging in colour from cream to shades of pink and green, on Man River (tp. 52, range 4, W. 2nd. mer.); on Cracking River (tp. 50, range 7, W. 2nd mer.); on other small streams draining north into Carrot River. In the southern part of the Province, outcrops of bentonite beds occur on both sides of the valley at St. Victor (sec. 2, tp. 6, range 29, W. 3rd mer.) and in the Cypress hills, near Knollys (sec. 17, tp. 6, range 22, 3rd. merc.)

Alberta:

The most important deposits so far found are in the workings of the Rosedale Coal Company at Rosedale and in the buttes and cliffs of the Red Deer Valley near the same point and at Drumheller.

British Columbia:

Bentonite clays are reported to occur near Seventeen Mile House on the Cariboo road, Fraser River Valley and near the mouth of Gorge Creek, Dead Man River Valley, in the Kamloops District. The Department of Mines points out that the relationships indicate that these clays are derived from glassy volcanic rocks of the dacite-andesite type. The widespread occurrence to these rocks in the Interior Plateau region of British Columbia suggests that important bentonite deposits may exist there.

Bib.—Dom. Dept. Mines, "Bentonite", #626; Dom. Dept. Mines Investig. Min. Res. and the Min. Ind. 1923, "Bentonite".

BITUMINOUS SAND

An investigation carried over a period of years by the Mines Branch, Dominion Department of Mines, under the direction of Mr. S. C. Ells has demonstrated that the bituminous sands constitute a satisfactory material for the surfacing of roads and other allied uses, that areas are available, susceptible of economic industrial development and that, under favourable market conditions, having in view the trend of the petroleum situation, recovery of the liquid and solid hydro-carbons may be anticipated within a reasonable time. While asphaltic materials are mainly used for paving, they are also used extensively for other purposes. The finest grades of asphalt are used in the manufacture of paints and varnishes, japans, in marine and iron paints, acid-resisting paints and other protective coatings, also as an electrical insulator. It also has an application in the making of roofing preparations, in the manufacture of rubber substitutes, of water-proofing cloth and as a binder for briquetting coal.

Alberta:

The only bituminous sands in Canada occur in this Province, the Athabaska and Clearwater Valleys constituting the chief topographical features of this area, including a number of tributary streams; roughly speaking, they extend north and south of Fort McMurray, reached from Edmonton over the Alberta and Great Waterways Railway, and are the largest known body of asphaltic material. Speaking of the extent of the deposit Mr. Ells says in his latest report: "It is at present impossible to attempt an accurate estimate of the area underlaid by bituminous sands. The writer has examined upwards of 270 individual outcrops, all of which represent parts of an almost continuous deposit. These outcrops occur at intervals along the Athabaska River and its principal tributaries for a total distance of more than 220 miles. On the Athabaska River the most northerly exposure of apparent commercial importance occurs in Sec. 16, Tp. 98, Range 10. Other minor exposures are, however, seen along the Athabaska as far as the northern boundary of Tp. 105. The direct distance in a north and south direction, through which outcrops have been noted, is approximately 115 miles and that from east to west approximately 45 miles. Extensions of the deposit under heavy overburden, particularly towards the south will materially increase this estimate". In addition to these occurrences others at more remote points have been observed by this engineer.

During 1914, a quantity of bituminous sand was shipped to Edmonton and laid as a pavement which was opened to traffic in 1915; in 1926, the pavement was still in first-class condition and had required no repairs. In the latter year an experimental pavement of three and one-third miles was laid from Jasper station to Jasper Park Lodge, which has so far proved a highly satisfactory roadway. The platform at Jasper Station was also laid with this material, and it was used at various points in Ontario for platforms and other uses on the properties of the Canadian National Railways. According to eminent authorities the oleaginous constituents of these enormous bodies are such that they would meet the world's demand for oil for over a hundred years. In years to come it will be realized that these deposits are one of Canada's most valuable assets.

Bib.—GSC Reports: 1891, Part "D", "Report on a portion of the District of Athabaska"; 1879, "Report on Northern Part of B.C., and Peace River Country"; 1875, "Report on Exploration in B.C."; 1884, "Report on part of the Basin of the Athabaska River". GSC Summary Reports 1913-14-15-16-20-22-23-24. Dom. Dept. Mines, "Bituminous Sands of Northern Alberta" 1924, and 1926, #625 and #632.

BUILDING STONES

Distributed throughout the districts served by the Canadian National Railways, are bodies of building material convenient to the railway. As building activities increase, these deposits should produce valuable traffic.

It is not possible to cover all the deposits suitable for building and ornamental purposes found along the line, but a complete table of operating properties is issued by the Department of Mines, at Ottawa, which includes operations in all the Provinces of Canada.

Nearly every variety of stone may be used for building purposes, quality, accessibility and cheapness being the three main factors governing its use. For practical purposes the building stones are classed into four groups, (1) sandstone and related rocks; (2) limestone and related rocks; (3) granite and the igneous rocks, (4) slate. Also ornamental stones used for decorative purposes. It is a regrettable fact that few quarries have been opened to meet the demands of the market, and much Indiana sandstone and limestone is imported largely by reason of the low cost at which this material can be laid down when produced in the very large quantities by these quarries in the United States.

The same condition prevails regarding marble, for while Canada has large deposits of high quality and quantity, the major portion used for decorative and monumental purposes is at present imported from the United States.

Nova Scotia:

Sandstone of an excellent colour for building purposes is quarried at Wallace, Cumberland County, and New Glasgow, Pictou County. Limestone is also quarried at Sydney and New Glasgow, and is used largely by the steel companies as a flux. Building stone has also been shipped from Wallace, Cumberland County and Nictaux West, Annapolis County.

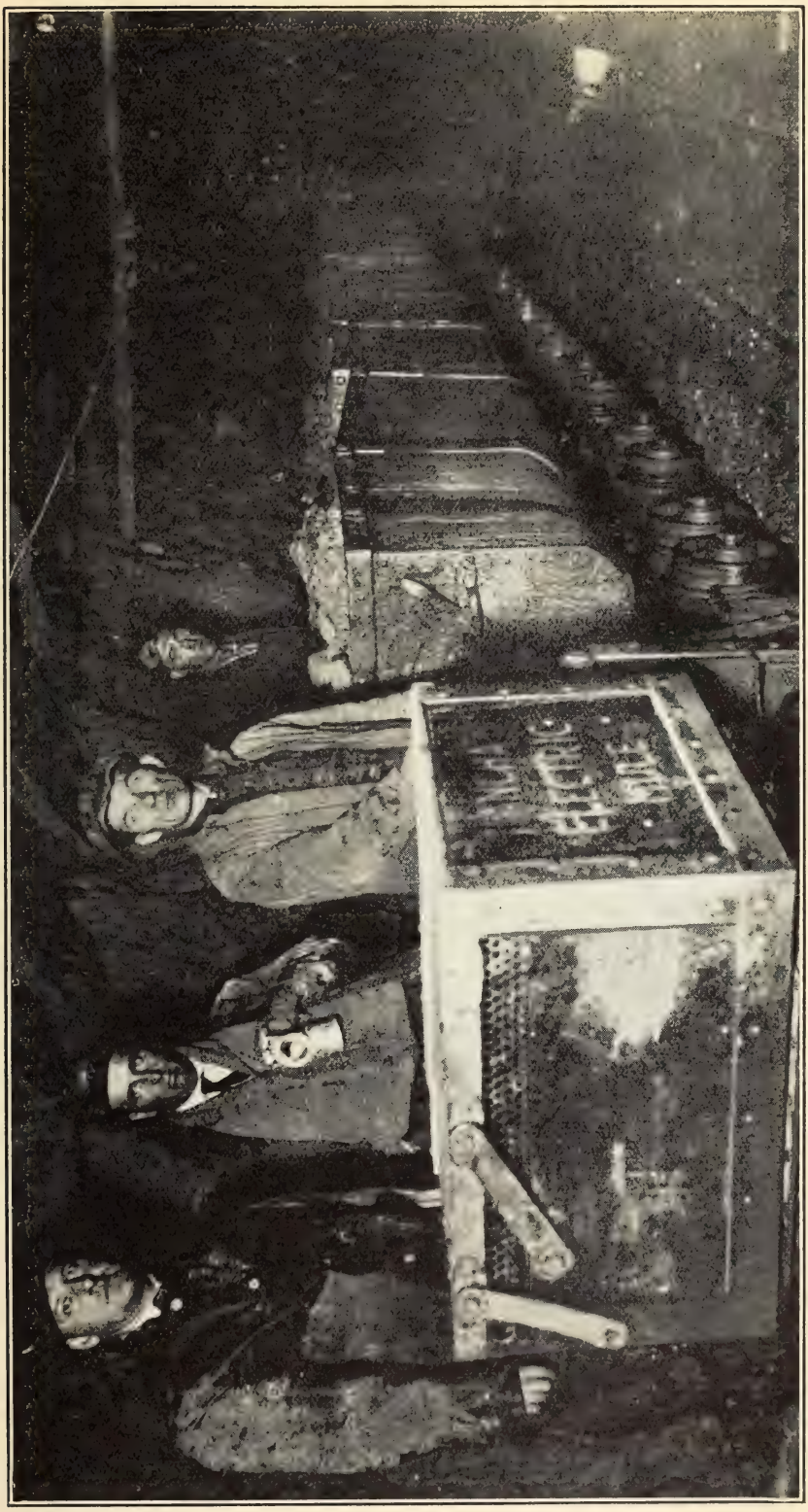
New Brunswick:

Sandstone is quarried at Stonehaven, Gloucester County, and Dorchester, Westmorland County. It is also found in suitable varieties in the counties of Kent and Northumberland. Limestone is quarried at Torryburn near St. John, also at Lawlor's Lake.

Quebec:

Large operations are carried on in the quarrying of limestone in the Province of Quebec, the most important operations being in Hochelaga, Jacques Cartier, Joliette and Portneuf. Modern lime kilns have been erected at Joliette, St. Marc, Mount Joli, Montreal and St. Dominique. Roofing slates have been quarried at Rockland near Richmond, also at Melbourne, Danville and Brompton.

A band of Potsdam sandstone occupies part of the counties of Soulanges, Beauharnois and Vaudreuil. An exposure of this band is found east of St. Jerome in the vicinity of St. Canut, and is a very pure sandstone. A quarry



Electric mule train in a Northern Ontario Mine

with a face 75 feet long by 15 feet high was opened some years ago south of the Canadian National Railways and a siding built. Since that time some very high-grade stone has been shipped. Analysis by the Provincial Government Laboratory shows that the stone from this, and the adjoining lot, runs 99.7 in silica. The only other rock equivalent in quality as a source of silica in the Province of Quebec is that reported by L. H. Cole, in the Pilgrim Islands.

Ontario:

Granite is quarried in the counties of Hastings, Leeds and Ontario, also in the Parry Sound district. A deposit opened up at Coehill, Central Ontario, finds a market for monumental purposes.

Sandstones quarried in Ontario are obtained principally from three formations, the Potsdam, Medina and Oriskany. The principal areas are South Frontenac, Brockville, Rideau, Smiths Falls, Perth. In the Niagara district, the Medina sandstones are found along the face of the Niagara escarpment, also near Merritton.

Lime tone is found in the St. Lawrence, also near Smith's Falls, L'Original, Pembroke, and in Central Ontario near Kingston, Napanee, Strathcona, Newburgh, Tweed, Marmora, Madoc and Chaffey's Locks. At Marmora, there is a large body of high grade limestone that would be suitable for the making of calcium carbide or any other purposes where a high calcium content is essential.

No slate is being produced in Ontario at the present time, and the only deposit of economic value so far developed is that in the vicinity of Eldorado, in the township of Madoc, where a belt of considerable width in extent has been traced for a mile in an east and west direction. The slate is of a good blue-grey colour and would appear very satisfactory for roofing.

Trap rock, suitable for road work and kindred purposes can be found at Belmont, Deloro and other points on the Central Ontario Division.

At Bronson is found one of the finest bodies of marble on the continent of America, proved to some extent by quarrying and core drilling, but lying more or less dormant. Here are found the finest-grained and highest qualities of marbles in unlimited quantities, and of a large number of varieties, including all the standard marbles used for ornamental purposes in the building trade. Authorities agree that these dolomitic marbles cannot be excelled for exterior and interior work. This industry is capable of great development, not only for domestic trade, but also for export.

A deposit of white marble is being quarried at Portage du Fort. This is a white dolomite of rather coarse crystalline structure and should be suitable for exterior building stone.

Manitoba:

There are deposits of red, pinkish-grey, and black granite of fine quality on the Greater Winnipeg Water District Railway, east of Winnipeg, where a quarry has been established. There are also beds of red granite of high quality on the transcontinental line of the Canadian National Railways, near Farlane Station.

Manitoba also contains extensive deposits of limestone in the Winnipeg district and near Lake Winnipegosis. It is used extensively for both exterior and interior building purposes, for road material, the making of lime, and is suitable for agricultural purposes.

Alberta:

The building stones used in Alberta are comparatively young in age. The basal beds in the Paskapoo formation contain a grey to yellow sandstone which has been quarried at Entwhistle on the Canadian National Railway, at the crossing of the Pembina River, and utilized in buildings as monumental stone in Edmonton.

Other building stones that are utilized in construction are bluish to buff sandstone from Monarch near McLeod; a yellowish to buff sandstone from Glenbow, west of Calgary; and a light yellowish sandstone from the Edmonton formation near Castor.

British Columbia:

Marble has been quarried on the northeast shore of Deserted Creek, Nootka Sound, Vancouver Island. The deposit consists of a large mass of crystalline limestone. The operations showed that this marble could be quarried in large blocks, could be sawn and polished and was suitable for building and ornamental purposes. A small operation is carried on at Grant Brook, where rose-pink and green marbles are quarried. At Bruce Lake, three miles from the C.N.R. Okanagan Branch, seventeen miles from Kamloops, a quarry has been opened upon an exposure of andesite, a good building stone which may be sawn into blocks. This development should result in the stone not only finding a market in Kamloops, but also on the Pacific Coast.

Bib.—Dom. Dept. Mines "Building and Ornamental Stones of Canada", Vols. Nos. 100, 203, 279, 388 and 452. GSC "Road Material Surveys" 1914, #85, and 1915 #99. Ont. Dept. Mines' "Limestones of Ontario", Vol. XIII, Part 2. GSC "Report on NW Man. with Portions of adjacent districts of Assiniboia and Saskatchewan" 1890-91, Part "E"; GSC "Report on the Geology of the West Shore and Islands of Lake Winnipeg", 1898, Part "F".

CHROMITE

Chrome ores, the sources of chromium products, are found in the provinces of Quebec and British Columbia. The main consumption is in the manufacture of chrome and chrome-nickel steels, stainless steel, rustless iron and other alloys. Chromium chemicals are also in demand, such as bichromate of soda and bichromate of potash, used in the tanning industry, also pigments having a chrome base.

The main source of world supply at the present time is Rhodesia, where high-grade soft ore is mined. The increasing use of stainless steel is, however, stimulating new interest in Canadian ores.

Quebec:

The deposits of most economic importance occur in this Province in the counties of Brome, Megantic, Richmond and Wolfe, also in Gaspe, where it occurs in the serpentine rocks, the ore bodies being more or less lenticular. The greatest production has taken place in the township of Coleraine, Megantic

County. A certain amount of the ore mined has been found to be sufficiently pure to be merchantable, but most of it had to be concentrated to raise the chromium content to the 45% Cr_2O_3 demanded by the market. When the chemical industries for the Maritime Provinces are developed, which they undoubtedly will be, based on coal and salt deposits, cheap chlorine will be available and a new field will then be opened up for the utilization of the chromite, both with respect to cheap beneficiation of the ores and in the form of chromium chemicals.

British Columbia:

There are few known occurrences in the territories served by the Canadian National Railways. Chromite occurs, however, in some abundance in veins and dykes in volcanic rocks, on Scottie Creek, Bonaparte River, 18 miles north of Ashcroft. It is also found in small quantities through the peridotite of Olivine Mountain, Similkameen Mining Division. The Department of Mines points out as an item of scientific interest that minute diamonds are found associated with chromite in the peridotite rocks in British Columbia, and also in some of the chromite in Quebec.

Bib.—GSC "List of Canadian Mineral Occurrences", Memo. #47; GSC "Geology & Economic Minerals of Canada", #2065; GSC Summary Report 1917, Part "E", "Chromite in Quebec"; Summary Report 1911. Dom. Dept. Mines "Chrome iron ore deposits in the Eastern Townships", #29.

CLAY and SHALE

Clay consists in the main of silicate of alumina, water, and many lesser constituents such as lime, magnesia, iron oxide, also alkalies in greatly varying percentages. It often contains sandy matter made up of quartz, feldspar and other minerals.

In general, clay is described as "a plastic mineral, the result of weathering or the breaking down of rocks". Clay or shale suitable for the manufacture of building brick, sewer pipe, tile and pottery are found in every province in Canada, and a large number of industries exist to take care of local needs. Refractory clays are manufactured at Sydney, N.S.; Montreal and St. Johns, Que.; Claybank, Sask.; and Clayburn, B.C. Plants for the manufacture of sewer pipe and kindred products are operating at New Glasgow, N.S.; St. Johns, P.Q.; Swansea and Mimico, Ont.; and Medicine Hat, Alta. A complete list of the manufacturers of clay products is published by the Dominion Department of Mines.

In the region between Winnipeg and the Rocky Mountains are found surface clays and shale formations. Surface clays are in general use, but the shales may be considered of more permanent value. The surface clays used for brick-making purposes are classed by the Geological Survey as (1) rock clay, (2) river terrace or flood-plain deposits, (3) delta deposits. The shale formations available for clay-working, include the Noibara, Pierre, Belly River, Edmonton, Laramie and Miocene.

Nova Scotia:

Clays that can be used on the potters' wheel as they come from the bank are found at Avonport, Middletown, Bridgetown, also at Shubenacadie and Elmsdale on the railway between Halifax and Truro. Stoneware clays occur at Middle Musquodoboit, and at Shubenacadie.

New Brunswick:

Red brick clays suitable for making coloured earthenware with little preparation are found in a number of places including the vicinity of St. John, Albert Mines and Bathurst.

Prince Edward Island:

Clays are found in this Province that are exceptionally plastic and suitable for the making of various classes of wares involving wheel work; they burn well and take a good glaze.

Quebec:

Kaolin of high quality is found at St. Remi d'Amherst, in the Province of Quebec, where extensive operations have been carried on for a number of years. There is a large body of high grade kaolin developed suitable for the manufacture of the finest ceramics, and also as a filler for high-grade papers There is also in this deposit much discoloured kaolin that can be used as a fire clay or, if washed, would be suitable for the making of coloured pottery. There is an opening to establish a plant for making alum in Canada for which these stained clays could be used. In this province are distributed various deposits suitable for the making of brick and vitrified tile and kindred products.

Ontario:

Clays suitable for brick-making are widely distributed in this province. The industry has developed in the main near the larger commercial centres. Shales are also used at a number of plants such as at Milton, Cooksville, Toronto and Streetsville.

The Ontario Department of Mines gives the following information with reference to deposits in Northern Ontario. "Pure kaolin or china clay is rarely found in Ontario, owing to the entire area having been subjected to glacial action which scoured off residual clays and other superficial deposits and re-sorted this displaced material in the form of boulder clay, sand or gravel. Certain deposits of cretaceous refractory clays have escaped glacial erosion. They have been found on the James Bay slope in the valleys of the Abitibi, Mattagami, and Missinabi Rivers, but, until 1924, these deposits were remote from transportation."

In 1916, an important discovery of china clay was made in Kipling township on the east bank of the Mattagami River, about 60 miles north of Moonbeam. It will eventually be served by the extension of the T. & N.O. Ry. The property comprises eight claims containing approximately 390 acres, with a frontage of over one mile on the Mattagami River. A partial exploration by diamond drilling indicates that the deposit is of great magnitude. Hancock says "to estimate the deposit at 100 million tons probably does the property scant justice." In quality it compares favourably with Cornish kaolin. This

property will also be a source of silica sand of high quality, for which there is a wide demand.

Manitoba:

Distributed throughout the Province are clay deposits suitable for brick-making; several brick plants are in operation. In the southern part of the province there are clays pronounced suitable for the making of drain tile.

Saskatchewan:

Experiments recently conducted at the University of Saskatchewan show that many clays found in that province are of extremely high quality and suitable for the production of finer ceramics, vases, tiles and interior decoration and other ornamental ware. This province contains raw refractories of quality known as fire clay and valuable argillaceous deposits from which can be manufactured a wide range of structural products. In general, the southern portion of Saskatchewan may be said to be rich in clay and shale deposits adapted to the manufacture of building brick, paving brick, and other clay wares. In Northeastern Saskatchewan exposures of benton shale of great magnitude represent a supply of raw material that will play an important part in meeting the requirements of the market of the future for structural building material.

From the Lake of the Rivers district, what may be classed as ball clay is shipped to the potteries of Medicine Hat to be mixed with Eastend clay for the manufacture of pottery and sewer pipe. These clays are plastic and more refractory than the clays at Eastend and burn a creamy white.

The important centres of production in Saskatchewan are Claybank, where refractory products are manufactured, Bruno, Estevan, Meota, North Battleford and Prince Albert.

Alberta:

Surface clays of flood-plain, river terrace, and lake origin have been worked at various points along the Canadian National Railway lines in the vicinity of Edmonton; along the Red Deer Valley at Red Deer and Drumheller, and at many intermediate points.

Clays suitable for common and pressed brick, for tile and sewer pipe, are known to occur. The presence of a colloidal clay, bentonite, causes a high shrinkage, so that careful attention is required in drying, burning and utilizing the clays for higher grades of ware. Residual clays, from the disintegration of shale beds, are manufactured into common brick by the stiff mud process, near Smoky Lake on the St. Paul de Metis branch of the Canadian National Railways. At Evansburg, on the main line of the railway west of Edmonton, there is a clay that burns very hard and is suitable for the manufacture. The varieties of clay in Alberta are many because the origin of the clay is so varied.

The largest clay plants are located at Medicine Hat, but the raw material used is imported from Southern Saskatchewan, where there are extensive deposits of refractory and semi-refractory clays with white burning properties. Besides brick, sewer pipe, and tile, and hollow ware, these clays are manufactured into stoneware, whiteware and even into higher grades of pottery.

British Columbia:

There are a number of deposits of workable shales in British Columbia suitable for the making of good hard brick. Amongst these might be mentioned deposits on Pender, Gabriola, Graham and Procher Islands. On the southern side of the Fraser River near Glen Valley, the Canadian National Railways skirt cut banks of laminated grey clays which may be termed good all-round clay; the deposit is favourably situated for development, both as regards rail and water transportation. From experiments that were conducted with this clay it would appear to burn an excellent red. While the formation in the vicinity of Prince Rupert does not include shale that can be employed for brick-making, there are a number of deposits of glacial clay available that are well located. Amongst these may be included those on Graham and Porcher Islands, already referred to. There is also a deposit in the vicinity of Amsbury station which has shown satisfactory tests.

Bib.—GSC Memoirs Nos. 24, 25, 47, 65 & 66 "Clay and Shale Deposits of the Western Provinces", Parts I, II, III, IV and V. GSC Memoir 16-E, "Clay and Shale Deposits of N. S., and Portions of N. B;" Memoir #64, "Clay and Shale Deposits of Quebec"; Memoir 142, "Clay and Shale Deposits of Ontario". Ont. Dept. Mines' Reports: "Clay & Shale Deposits of the Abitibi & Mattagami Rivers", 1920, Vol. XXIX, Part II; "Clay and Shale Industry of Ontario", 1906, Vol. XV, Part II; "Clays of the Missinaibi River", 1921, Vol. XXX, Part I.

COAL

It will be seen from the reports of the Geological Survey that Canada has large supplies of bituminous and sub-bituminous coals situated mainly in the Western Interior, also important coal fields on both the Atlantic and Pacific Coasts. Canadian deposits comprise one-sixteenth of the world's coal reserves.

Bituminous coals are extensively mined on the Atlantic sea-board, and are in general use for railway and marine transportation, for manufacturing purposes, production of power and in the reduction of iron ores; they are also exported to a limited extent, and transported by the St. Lawrence route for use in the Province of Quebec.

On the Pacific coast, bituminous coal is marketed for domestic purposes, bunkering, power, for coke ovens and for export. Dr. D. B. Dowling says: "The interior portion of British Columbia has many coal areas that will be of value in producing coking coal for the smelting of the ores for which this province is famous." The interior fields supply coals of various grades, the coals of the mountainous region of Eastern British Columbia and Western Alberta being the most important and of the highest grade.

In Manitoba and Southern Saskatchewan, the fields supply coals, lignitic in character, that are adapted to domestic use. The extensive coal fields of Alberta, which contain coals of a wide range of character, form Canada's greatest coal reserve.

It may be of interest to recall early discoveries of coal in Western Canada, in the areas now served by the Canadian National Railways. In 1789, Sir Alexander Mackenzie records finding coal on Beaver River. In 1793, Peter Fidler in a journey across the plains in that year found coal on Red Deer River. This information is published on Arrowsmith's map of 1811. A note on the

map, near the mouth of Rosebud Creek, called then Edge Creek, calls attention to the quantity of coal on that Creek, which afterwards became the centre of such active mining operations when opened up by the lines of the Canadian National Railways. Dr. Hector, Geologist with the Palliser Expedition, on his journey to Edmonton, passed through the Brazeau Range and along Miry Creek, the route now followed by the C.N.R., to the present mines at Nordegg, where he noted the presence of coal. Later, while staying at Jasper House, in the Athabaska Pass, near the present station of Devona, on the C.N.R., he visited the gorge of the Snake Indian River, and published notes on the occurrences in that region.

Dr. D. B. Dowling, in 1915, estimated the coal reserves of Canada as follows:—

TOTALS BY PROVINCES	Metric Tons
Nova Scotia	9,718,968,000
New Brunswick	151,000,000
Ontario	25,000,000
Manitoba	160,000,000
Saskatchewan	59,812,000,000
Alberta	1,072,627,400,000
British Columbia	76,034,942,000
Yukon	4,940,000,000
North West Territories	4,800,000,000
Arctic Islands	6,000,000,000
	1,234,269,310,000

Nova Scotia:

The principal mining centres are in Inverness, Victoria, Cape Breton, Pictou, Cumberland, Colchester and Richmond Counties. Of these the largest production comes from Cape Breton, from the operations of the Dominion Coal Company and Nova Scotia Steel and Coal Company, now incorporated in the British Empire Steel Corporation. The Sydney, or Cape Breton field is the chief producer, it is bounded by the Atlantic Ocean and has splendid shipping facilities.

New Brunswick:

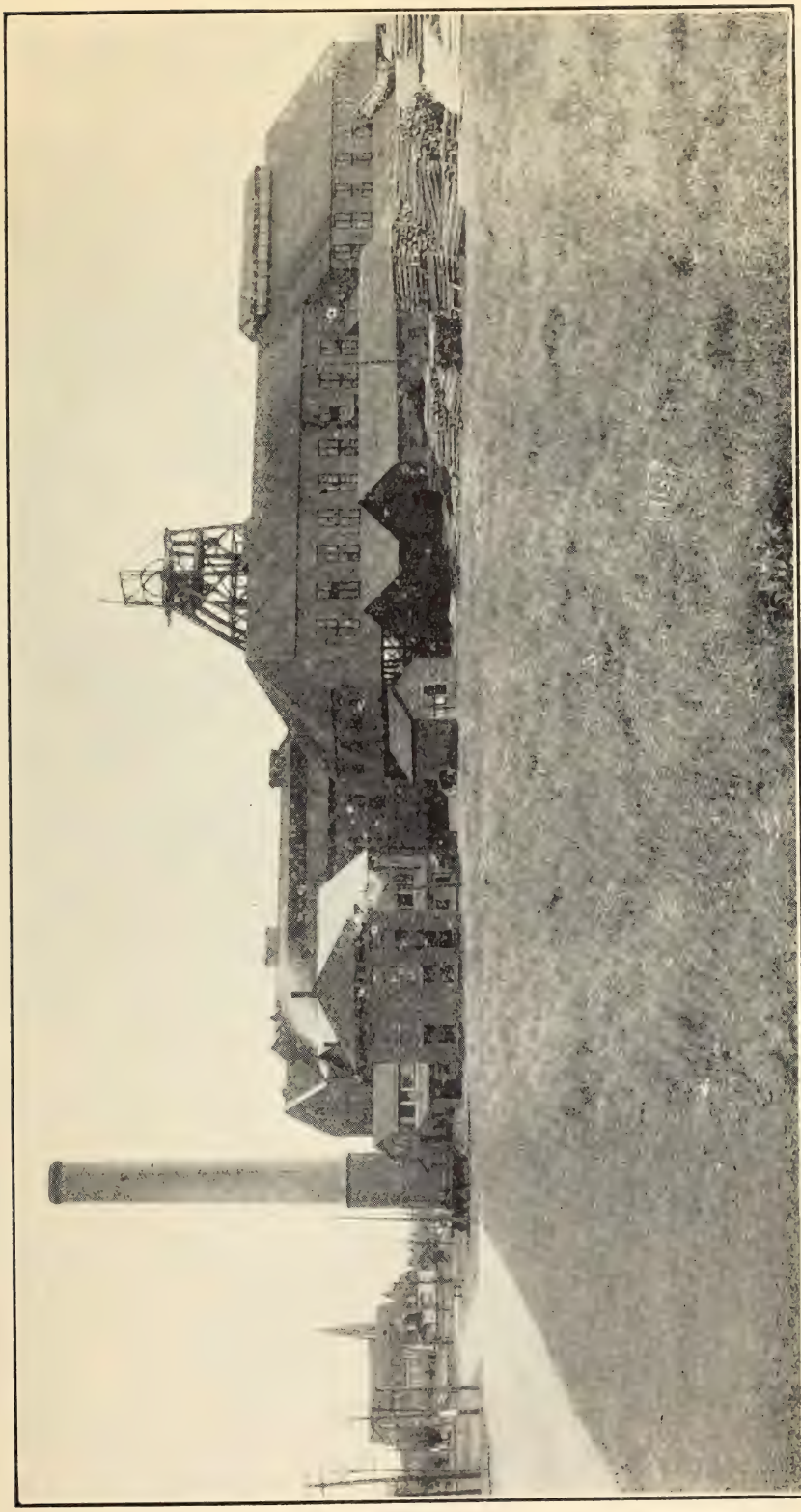
Coal is mined in Queens, Sunbury, and Kent Counties, the main production being from the Minto coal fields.

Saskatchewan:

There are a large number of more or less small operations carried on in this province, Estevan, Bienfait, and contiguous territories being responsible for the heaviest production of lignite.

Alberta:

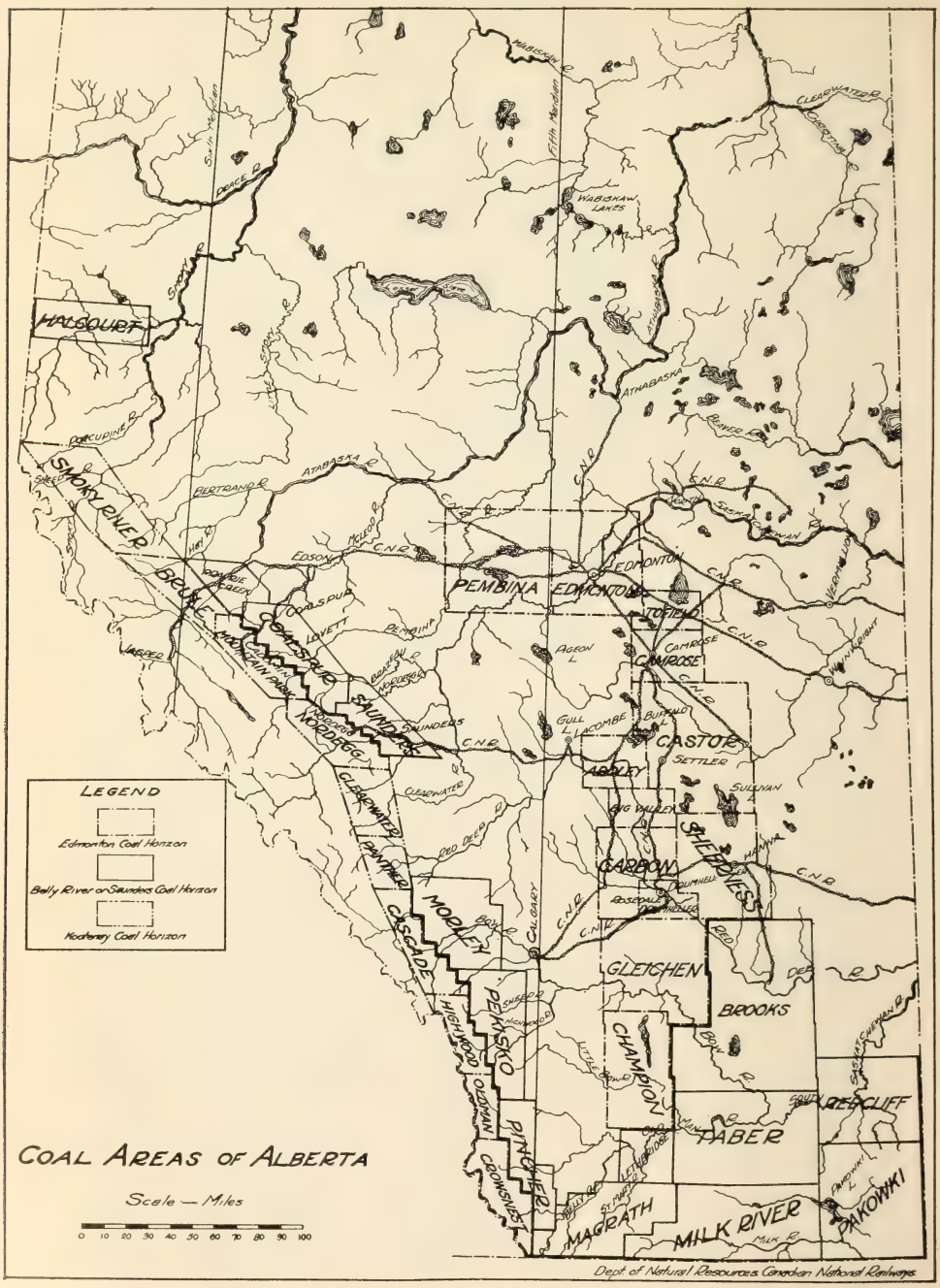
Over three hundred coal mines are being operated in the province of Alberta. Coal mines situated at the following places in the Rocky Mountains and foothills mining in the main bituminous coals, are served by the Canadian National



Coal Mine, New Glasgow, N. S.

Railways: Saunders, Nordegg, Harlech, Mountain Park, Lovettville, Brookdale Mines, Foothills (Mudge), Basing, Cadomin, Coalspur, Edson, Pocahontas, Bedson, Brule Mines.

Mines situated east of the Foothills, mining domestic or sub-bituminous coal, served by the Canadian National Railways, in whole or in part: Drum-



heller, Big Valley, Hanna, Troches, Three Hills, Battle River District, Camrose, Tofield, Clover Bar, Edmonton, Namao, Cardiff and Wabamum.

British Columbia:

There is an occurrence on the line to Vancouver at Chu Chua in the Kamloops district, where a limited amount of development has been done, but where the properties give great promise. On the Prince Rupert line, seams on Goat and Mud Creeks operated by the Telkwa Collieries, Limited, were the first mines opened in the district. The Prince Rupert Collieries have holdings west of Telkwa. A coking coal is found near Telkwa, also at Seaton Station, west of Smithers. Reports indicate that there is a considerable body and analysis shows that it is of good quality and will produce 74 per cent of firm coke free from impurities. Amongst the important coal deposits in this portion of British Columbia are the Ground Hog fields, situated 140 miles north of Hazelton. This field contains large and valuable deposits which lie dormant awaiting transportation facilities.

Activity in the development of the cold areas of Northern British Columbia is being stimulated by the growth of Prince Rupert, and by increased settlement along the Canadian National Railways (G.T.P.), which has expanded the domestic market very materially.

Recent developments on Vancouver Island are encouraging and the output is being well maintained.

Bib.—GSC Reports: "Coal Fields and Coal Resources of Canada", Memo. #59; "Coal Fields of B.C.", #69; "Southern Part of the Sydney Coalfield, N.S.", #133; "Minto Coal Basin", #151. GSC "Telkwa River and Vicinity", #988. GSC Summary Reports 1918, Part "F"; 1919, Part "C"; 1923, Part "B"; 1923, Part CII. Dom. Dept. Mines' "Investigation of the Coals of Canada", Vols. I to V inclusive. Dom. Dept. Mines "A General Survey and Description of the Coalfields and Coal Industry of Eastern Canada", #430.

CORUNDUM

Natural corundum is composed of practically pure alumina. Next to the diamond it is the hardest mineral found. It occurs in the form of crystals of various sizes disseminated in syenite. It is separated from the rock matrix by crushing and concentration; it is then ground and graded as to the size of the grains. Corundum is employed for grinding and polishing in the form of powder, also as wheels.

Ontario:

The only deposits worked in Canada up to the present time are those situated in the townships of Raglan and Carlow in Eastern Central Ontario. These deposits were operated for a number of years on a fairly large scale, but the cost of recovery, by the process applied, made the price of the product prohibitive in competition with the artificial abrasives that have come into use in recent years, such as carborundum, produced in the electrical furnace from silica and carbon.

Bib.—GSC, "Corundum, Its Occurrence, Distribution, Exploitation and Uses", Memo. #57. GSC, "Geology and Economic Minerals of Canada", #2065. GSC Summary Report 1906. Ont. Dept. Mines' Reports. Dom. Dept. Mines' "Abrasives, Part II, Corundum and Diamond", #675.

DIATOMITE

This material, frequently incorrectly referred to as tripolite, infusorial earth, diatomaceous earth, kieselguhr, and under various trade names, is a light earthy material resembling chalk. It is composed of minute siliceous skeletons of flowerless aquatic plants known as diatoms, microscopical or minute organisms present in both salt and fresh water. It is usually found mixed with small quantities of lime, alumina and other impurities. It occurs in the provinces of Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia.

Owing to its porous character it has great absorptive powers and high insulating efficiency, due to the presence of innumerable minute enclosed air cells which cause it to be a poor conductor of heat and sound; it is also a most effective filtering medium. The hardness, the minute size, and angular nature, make it an excellent polishing agent.

In the past, diatomite has been largely used as an abrasive in the form of polishing powders and scouring soaps, but of late its uses have been considerably extended. Because of its porous nature it has been used in the manufacture of dynamite as a holder of nitroglycerine, and of chemicals composing a surface cleanser, recently introduced in the paint trade. It is also used by sugar and oil refineries for filtering or clarifying. Its porosity also renders it a non-conductor of heat, and this quality in connection with its lightness has very greatly extended its use as an insulating packing material for safes, steam pipes, boilers and metallurgical apparatus; in making insulating brick; and as a fireproof building material. Recent experiments show that it can be manufactured into wallboard and utilized in other forms as a building and insulating material. In this country it is used in the manufacture of gramophone records. In recent years it has been found to have an increasingly wide application. It is used as a chemical reagent in preparing artificial fertilizers, especially in the absorption of liquid manures; in the manufacture of sodium silicate or water glass; of various cements; in glazing tiles; in artificial stone; as a carrier of ultramarine and various pigments; aniline and alizarian colours; in filing paper; and in the preparation of sealing wax, fireworks, gutta-percha products, Swedish matches, solidified bromine, scouring powders, papier mache, and many other articles.

Nova Scotia:

The most important deposits so far worked in Canada are situated in Victoria, Cumberland, Cape Breton and Inverness counties. There is also a deposit of some magnitude reported in Annapolis county.

The largest known deposit in Nova Scotia is at Folly Lake, near the Canadian National Railways, where it crosses the Cobequid Mountains; this deposit has been worked. Eight miles from Minas Basin at Port Opic, is another deposit that has been worked to a small extent. Near Castlereagh a large deposit occurs in Bass Lake, where an operation was carried on for some time and the product prepared for the market. Other deposits occur in Pictou County; Colchester and Halifax Counties; also in Inverness and Victoria Counties, Cape Breton.

Quebec:

While there are occurrences of diatomite in Portneuf, Montcalm and Montmorency Counties, practically no development has been carried on.

British Columbia:

There are occurrences of the material in the vicinity of Kamloops, Savona, Ashcroft and on Vancouver Island.

Of the deposits reported in other provinces, none have been worked and they are not at present regarded as of economic value.

Bib.—GSC, "Mineral Resources of Canada—Infusorial Earth", #857; GSC, "Geology and Mineral Resources of New Brunswick", #983.

FELDSPAR

Due to a scarcity of potash spar in the United States a much wider market will be found in the future for Canadian feldspar, particularly the higher grades. There is also a growing interest on the part of the grinders, who supply the large potteries, turning out finer grades of china in Great Britain and France, in Canadian No. 1 and No. 2 spar, as the Scandinavian product, which they are now receiving, is not equal to the Canadian product. A proper system of grading will have to be established that will ensure the marketing of a standard product, and steps to this end have been given consideration. One of the difficulties encountered in shipping crude spar is the lack of loading facilities at ocean ports.

Feldspar is used principally in the manufacture of pottery, china-ware, porcelain, enamel-ware and enamel brick and tile. It is used in both the body and glaze of ceramic products. In the body it constitutes from 10% to 35%, its value being due to the fact that it melts during firing at a temperature below the fusing point of the other constituents and forms a firm bond between their particles. In glazes and enamels it constitutes from 30 per cent to 50 per cent.

Feldspar is used as an abrasive, and as a constituent of scouring soaps, for which purpose very clean feldspar is required. Other uses for feldspar are in the manufacture of emery and corundum wheels, where it serves as a binder; in the manufacture of glass and ferro-silicon; as poultry grit; as a constituent of roofing material, and for surfacing concrete work. Small quantities of the purest grades of potash feldspar are used in the manufacture of artificial teeth.

The Canadian product averages about 11 per cent potash, though some deposits show as high as 14 per cent. Attempts to extract potash from feldspar are still in an experimental stage.

Almost the entire production of Canadian feldspar is from the Provinces of Ontario and Quebec, though small operations have been carried on in Nova Scotia and British Columbia.

Nova Scotia:

A small operation has been conducted for some time, a short distance from the City of Halifax, by the Feldspar Extracting Company.

Quebec:

At the present time there are no operating properties served by the Canadian National Railways, though deposits have been operated in the counties of Labelle, Ottawa and Saguenay.

Ontario:

The main deposits in Ontario are situated in the counties of Frontenac Hastings and Leeds. A notable mine is that known as the Richardson, situated, north of Harrowsmith. Operations have been carried on at Bancroft and at Hybla on the Central Ontario Branch, Pembroke, Westport, Perth Road, Parry Sound, the vicinity of Sudbury, Gordon Bay, also on the Magnetawan River. There is also a very high-grade deposit in the township of McConkey, north of Parry Sound. Intensive prospecting will undoubtedly result in the finding of a number of workable deposits on privately owned property in the counties previously mentioned. Grinding plants are operated at Toronto and Kingston.

Graphic granite is coming into use both for body material and glaze in the production of ceramics. A very large body of this mineral occurs near Wilberforce. Its average content shows 6 per cent soda and the same percentage of potash, and is found not only satisfactory in the making of porcelain insulators, but an excellent binder in the manufacture of a number of wares. On account of the scarcity of potash spar in the United States, the market for this commodity should be wide, particularly as it is very free from impurities. Other occurrences of this mineral are found in Hastings district. By far the largest portion of feldspar produced in Ontario is shipped by Cobourg and car-ferry to grinding companies at Rochester, N.Y. Only a small quantity is ground in Ontario.

Bib.—Dom. Dept. Mines "Feldspar in Canada", #401. Investigation Mineral Resources and Mining Industry, 1923 "Feldspar". Ont. Dept. Mines' Reports.

FLUORSPAR

Fluorspar, or fluorite, is a crystalline mineral which usually occurs in glassy, transparent cubes. Less commonly, it is granular or of fibrous structure and, occasionally banded. It has a specific gravity of 3.2, is brittle, and can easily be scratched with a knife. Chemically, it consists of calcium and fluorine in the proportion of 51.1 to 48.9. In colour, it ranges according to purity from a clear colourless, or slightly bluish, glasslike substance, to brilliant hues of purple and green. It is used in the production of basic open-hearth steel; as a flux in some blast-furnace operations and in iron and brass furnaces; in the manufacture of ceramic products such as enamel and sanitary ware; opalescent glass; facing for bricks; vitriolite and in the manufacture of hydrofluoric acid; in the smelting of gold, silver and copper and in the refining of ores; in carbon electrodes and in the manufacture of sodium fluoride for wood preservation. Other miscellaneous uses of fluorspar that have been reported are in electrolytic refining of antimony and lead and in the production of alumina; as a bond for constituents of emery wheels, and in the recovery of potash in the manufacture of Portland cement.

The occurrence of fluorite has been noted at several points in New Brunswick, Quebec, Ontario and British Columbia.

Ontario:

This product is found in Hastings County, the most important operation being at Madoc. A deposit of some promise has been discovered at Wilberforce.

British Columbia:

The Consolidated Mining and Smelting Company operate the Rock Candy fluorspar mine and mill at Leach Creek, the only important producing property in this Province.

Bib.—GSC Summary Report, 1920, Part "D", "Fluorspar Deposits of Madoc District, Ont." Ont. Dept. Mines' Vol. XXVII, 1918, Part I, and later annual reports.

GARNET

Garnet is a name given to members of a group of silicates, of similar crystal habit and physical properties. They are usually red or red-brown in colour. They are employed for polishing and surfacing and have a special use in the leather trade for scouring and dressing, also in making sand paper.

Ontario:

Shipments have been made from a property in Ashby township, situated about 17 miles east of Bancroft, also from ores mined from a property at Depot Harbor near Parry Sound. Other localities where garnets are found are in Elzevir and Portland townships, Fishdale Lake in Harcourt township, also Loughlin and Dill townships south and east of Sudbury.

Nova Scotia:

In Yarmouth County, near Chegoggin Point, is a belt of garnet-bearing schist and of a very promising character, from which extremely fine grade of garnets have been taken. The belt is 36 feet wide and has been proved continuous for a distance of three miles to the northeast.

Bib.—Dom. Dept. Mines Reports: "Corundum and Diamond", #675; "Garnet" #677; GSC Summary Report 1919, Part "F", "Investigation in Southwestern Nova Scotia".

GRAPHITE

This mineral is composed of the elements of carbon. It is sometimes called "black-lead," and the term "plumbago" is also applied to it. Apart from North America the occurrences of flake graphite are few, the only ones of importance being in the Island of Ceylon, and in Madagascar, from both of which large quantities have been exported.

Graphite has peculiar physical properties—infusibility, chemical inertness, high conductivity, extreme softness and low specific gravity. The quality known as "flake graphite" is used mainly in the manufacture of crucibles and other refractory products. Unlike coal, which also contains a high percentage of carbon, graphite is unaffected by the heat attained in ordinary furnaces; it is only slightly acted upon by fluxes and is, therefore, found adaptable to use in crucibles and other vessels in which ores are melted. Graphite is also used in foundry facings, lubricants, stove polish, paint, lead pencils, in a preparation to loosen boiler scale, and as a polish for gun powder; it has also various applications in electrical work. Natural graphite may be either crystalline or amorphous.

It is found mainly in the provinces of Quebec and Ontario, and while it has been observed in other provinces, no deposits of commercial importance have yet been developed.

Quebec:

The principal deposits of graphite are situated in the townships of Buckingham and Lochabar, Ottawa County, and in Grenville, Argenteuil County.

Ontario:

Deposits of graphite are situated in Cardiff and Monmouth townships, Haliburton County; Monteagle, Hastings County, where the National Graphite Company operate a property near Mumford. In Hastings County, properties have been operated by the same company in the vicinity of Maynooth. Other deposits are found in the counties of Addington, Frontenac, Leeds and Lanark; in the latter, the Timmins property, in North Burgess, has been a producer. The Black Donald Mine at Calabogie, Renfrew County, is the most important producer of the amorphous and flake graphite in Canada.

The recent adoption of an improved method of separation, is likely to have a far-reaching effect on this industry in Canada when the market is favourable. It has been demonstrated that Canadian flake graphite can successfully compete in the U.S. market with the products of Ceylon and Madagascar, which have been in demand more particularly in the construction of crucibles.

On the I. B. & O. sub-division of the Canadian National Railways, there are a number of interesting prospects which offer opportunities for investigation and profitable development.

Bib.—Dom. Dept. Mines' Reports: "Graphite", #511; "Mineral Resources of Canada, 'Graphite' ", #877. Ont. Dept. Mines' reports.

GYPSUM

Though Canada is the world's third largest producer of raw gypsum, she imports the manufactured product from the United States in the form of plaster-of-paris and wallboard.

This mineral has a wide use, and during the war much of it was used in the manufacture of roofs and naval gun-shops, warehouses and other Government buildings, large quantities also being used in the United States in place of lath and plaster for temporary buildings erected by the authorities. Plaster board consists of thin sheets of gypsum plaster fabricated between sheets of tough fibrous binding material, sometimes three or four layers of felt or paper, alternated with layers of gypsum. It is also used in the form of blocks and tiles, and as plaster-of-paris in many forms, including surgical plaster. The qualities that make it valuable are that it sets quickly and makes a strong support; furthermore the plaster is a non-conductor of heat and is not affected by moisture It is used as a substitute for horn and hard rubber in the making of buttons and is also used in the cleaning of wool. Calcined, and with the addition of colouring matter and glue, it is used for tinting walls. The blackboard crayon, known as chalk, is made of finely pulverized raw gypsum. In various rubber goods, including some kinds of automobile tires, gypsum is used as a filler. It is also used in agriculture as a fertilizer.

The gypsum industry of Canada, consists largely in quarrying the mineral and shipping it in its crude form to the United States where it is calcined and manufactured. Some of the manufactured product is re-imported into Canada for domestic use. The industry of manufacturing gypsum has shown a marked development in recent years. The Ontario Gypsum Company has a plant with a large output at Montreal, in addition to the plants mentioned in Ontario. Another plant is the Iona Gypsum Products Limited, at Sydney, N.S.

The quality of gypsum found in Canada, particularly the whiterock of the Maritime Provinces and Ontario, is of an exceptionally high grade.

Many deposits of this mineral are distributed throughout Canada; the most extensively mined being those in the Provinces of Nova Scotia and New Brunswick, where the mineral is found associated with rocks of the Lower Carboniferous series. Many of these deposits are exposed in cliffs from fifty to two hundred feet in height.

Nova Scotia:

Gypsum is distributed throughout the province. The principal deposits are found near Windsor and Wentworth, in Hants County; Malagash and Pugwash, also near Amherst, in Cumberland County. It also occurs in quantities along the coast of Cape Breton Island, in the interior, and in the vicinity of Bras d'Or Lakes.

New Brunswick:

The principal deposits occur in Albert County in the vicinity of the town of Hillsboro; near the Petitcodiac in Westmorland County, and on the Tobique River at Plaster Rock, Victoria County; also in King's County.

Ontario:

The principal operations are along the banks of the Grand River in Haldimand County. Quarries and mills are located at Paris, Caledonia and Lythmore. There are occurrences also in the northern part of the Province contiguous to the extension of the T. & N. O. Ry. north of Cochrane. The deposits occur along the Moose River and towards the head of the French River in the same area. In places the deposits are estimated to be 40 feet in thickness.

Manitoba:

Large deposits of gypsum occur in the district situated one hundred and sixty miles north of Winnipeg, the centre of which is known as Gypsumville. The output of the operations is transported to Winnipeg where it is calcined and a variety of plaster products manufactured.

Alberta:

Deposits of gypsum are reported in several localities on Peace River. Beds of gypsum outcrop along the Peace River for a distance of fifteen, miles from Little Rapids down to a point five miles below Peace Point; the average thickness of the bed is fifteen feet. It has been estimated by Dr. Charles Camsell that the outcrop would indicate the presence of over two hundred million tons of this mineral. Beds of gypsum are said to exist some five hundred and fifty feet below the surface near Fort McMurray.

British Columbia:

The most important known deposit in British Columbia occurs at Falkland on the Kelowna Branch of the Canadian National Railways; the output of one of the deposits is shipped to the mill of the operating company situated near Port Mann, B.C.

Gypsum is found on the banks of the North Thompson River about twenty miles north of Kamloops, also at Martel on the main Thompson River, south of Kamloops.

Bib.—GSC Dept. Mines "Gypsum and Salt in Manitoba", 1913. Dom. Dept. Mines' "Gypsum in Canada, Its Occurrence, Exploitation and Technology", #245. Nova Scotia Dept. Public Works and Mines, "Gypsum", Pamph. #13. Ont. Dept. Mines' Report 1925, Vol. XXXIV, Part II, "Gypsum in Ontario", "Geology of the Gypsum Deposits of Southwestern Ontario".

MAGNESITE

This mineral is used in the making of fire brick for blast furnaces, and other purposes where a refractory lining is required; also for fire-proof flooring. Canadian magnesite, when properly treated, makes furnace linings comparable to the best Austrian product, formerly much in demand. This mineral is also used in the preparation of the chemical products of magnesia. When calcined in retorts carbon dioxide is produced, stored in cylinders under pressure and used for aerating mineral waters.

Reports on this subject are mainly confined to operating properties in Argenteuil County and from the reports of the Geological Survey it would appear that while there are other deposits, they are either not of sufficient magnitude or are too remote from transportation to be of economic value.

Quebec:

The principal operating quarries are in the township of Grenville. Deposits in the townships of Sutton and Bolton have been known since 1863, but there is no report of their ever having been operated.

British Columbia:

Hydromagnesites are found in the Clinton and Atlin Mining Divisions of the Province. The completion of the Okanagan branch of the Canadian National Railways from Kamloops to Vernon will give an outlet to the gypsum deposits situated about nine miles east of Grande Prairie, within a mile of the railway line. The deposits are reported to be of some magnitude and of high quality.

Bib.—GSC "Geology and Economic Minerals of Canada" #2065. Annual Reports, Que. Dept. Mines. Dom. Dept. Mines' "Mineral Industries of Canada 1924".

MAGNESIUM AND SODIUM SULPHATE

Natural deposits of these salts occur in Saskatchewan, Alberta and British Columbia. They vary in degree of concentration from slightly alkaline waters to bedded deposits that are completely dry. In Saskatchewan and Alberta some of the sodium sulphate deposits contain magnesium sulphate, notably that of Maskakee Lake near Dana, Sask. It is estimated by the Department of

Mines that there are upward of one hundred million tons of these hydrous salts contained in deposits in Western Canada.

These salts are, in one form or another, used in the chemical, textile, tanning, dyeing and glass-making industries, also in stock foods and salts for medicinal purposes. The most important market, however, for sodium sulphate is in the pulp-making industry, where it has to compete with salt cake, a by-product from the manufacture of hydrochloric acid. While a low freight rate is made by the railways for the transport of this product, the freight rates prevailing on the shorter haul of the product imported from the United States make the competition extremely keen. It also has to compete with the ocean-borne commodity from Europe.

A possible market for salt cake in Western Canada lies in the development of the straw paper industry, which has promising possibilities.

Saskatchewan:

More than 200 lakes in Saskatchewan are known to contain sodium sulphate. Of these, there are at least twenty which contain a sufficiently large quantity of salts to support a refining plant. However, as the market for this material is limited, only a few of these deposits would warrant commercial development at the present time, depending upon their size, purity and advantageous location with reference to water, fuel and transportation. There are three areas upon which production has been carried on, namely, Lake Maskakee, near Dana; Frederick Lake, near Dunkirk; and at Fusilier, near the Saskatchewan-Alberta boundary.

At Dana, Saskatchewan, on the Canadian National Railways, a large deposit covering an area of seven square miles is controlled by the "Salts and Chemical Company Ltd." It is estimated that the lake contains upwards of 10,000,000 tons of sodium sulphate. The lake is very favourably situated with regard to transportation, being adjacent to two lines of the Canadian National Railways.

Frederick Lake, near Dunkirk, is controlled by the "Bishopric and Lent Company." It is about three square miles in area and is estimated to contain 1,500,000 tons of Glauber's Salt. This lake is also close to transportation. A drying and refining plant has been installed by the owners.

Near the Alberta-Saskatchewan boundary at Alsask, on the Canadian National Railways, there is an alkali lake containing more than a million tons of sodium sulphate where production is proceeding. Among other large deposits which contain great quantities of salts may be mentioned Horse Shoe Lake, northwest of Horizon; Snakehole Lake, south of Cabri, and Plover Lake, north of Fusilier. All of these contain solid crystal beds of sodium sulphate of remarkable purity.

Alberta:

There is a deposit of sodium sulphate in a lake lying between Holden and Vegreville which so far has not been developed. Another deposit is found about six miles southwest of the town of Minburn, on the main line of the Canadian National Railways, east of Edmonton. This deposit, which is from ten to fourteen inches in depth, forms the bed of a lake about thirty acres in extent.

British Columbia:

At Epsom there is a unique deposit of magnesium sulphate of a very pure character. This has already found a market in Eastern Canada in the tanneries, and is sold as epsom salts for various purposes, medicinal and otherwise. These deposits are contained in five basins or lakes, the largest of which has an area of six acres, situated at a considerable elevation above the railway siding at Epsom. These deposits are covered with water from March until the middle of the summer, when the hot dry winds evaporate the water. Drilling operations have been carried on to forty feet in depth, and have proved up a large body.

Bib.—Dom. Dept. Mines: "Sodium Sulphate of Western Canada, #646; Investigations of Mineral Resources and the Mining Industry 1923, and 1924, "Sodium and Magnesium Salts of Western Canada" and "Magnesium Sulphate in British Columbia".

MICA

In recent years the production of mica in Canada has fallen off considerably due to competition, though with the exception of Ceylon and Madagascar, it is the only country in which amber mica, or the variety known as phlogopite, is found in economic quantities. The mica in common use is of two kinds, the variety already named and muscovite, or white mica. The latter is found both in India and the United States, while until recent years Canada was almost the only source of amber-mica. Amber mica is softer and more flexible than muscovite and more suitable for insulating purposes. In recent years, quantities of white mica have been in demand for use in the reproducers of gramaphones.

The mica deposits of Canada are mainly contained within an area of approximately twelve hundred square miles in the Province of Ontario. The two districts are separated geographically by the Ottawa River, and geologically by a belt of sedimentary rocks about forty miles wide.

Ontario:

The property of the General Electric Company near Perth Road, is one of the most important in America. There are a number of workable deposits in the counties of Frontenac, Haliburton and Leeds, including the Fulford mine, formerly the largest producer in Canada, also in McConkey township, Parry Sound district.

British Columbia:

Mica Mountain in British Columbia is an occurrence of interest, the main formation consisting of mica schists; the railway dump in the vicinity is largely composed of this material. Operations have been carried on at that portion of the mountain known as Niggers' Head, reached either from the station at Swift Creek or Tete Jaune. The values are found in pegmatite dikes composed of quartz, feldspar, muscovite mica, and certain other minerals, such as garnet, beryl and apatite segregated in large crystals. Some development has been carried on and when the market for this class of mica improves it is expected that a number of the claims will be operated.

A deposit of commercial value occurs on the west side of Findlay River, sixty-five miles above Findlay Forks, reached from Prince George over Giscome Portage.

Bib.—Dom. Dept. Mines, "Mica, Its Occurrence, Exploitation and Uses", #118. Ont. Dept. Mines' Reports.

MILL-STONE—GRIT

Grindstones are manufactured from mill-stone grit—a carboniferous formation widely distributed in Nova Scotia and New Brunswick. This is quarried and manufactured into an excellent grade of grindstone, ranging in size from very small stones to those used for the grinding of woodpulp, which weigh about two and a half tons each.

Nova Scotia:

In this province the manufacture of grindstones is a well established industry. Quarrying is carried on chiefly at Woodburn, Lower Cove and Quarry Island, Pictou County.

New Brunswick.

The quarries in this province are mainly situated in Westmoreland, Gloucester and Northumberland counties.

Stone reported to be suitable for grindstones is found in other localities in Canada, but has not been quarried to any extent.

Bib.—GSC "Geology and Economic Minerals of Canada", # 2065. Reports of the N.S. and N.B. Dept. Mines.

MINERAL PIGMENTS

Minerals of this character are found distributed in almost every province of Canada. When calcined, a wide range of colours are produced, including ochres, browns and reds. Some of these mineral pigments can be used in the raw state. At the present time the market for these commodities is more or less limited to domestic use.

Nova Scotia:

Deposits of ochre in Colchester County, N.S., have been worked from time to time as well as deposits of ferruginous clays. There is also a deposit in Yarmouth County.

Quebec:

Numerous deposits of ochre exist north of the St. Lawrence River, resulting from the decomposition of iron pyrites from the Laurentian Hills.

Ontario:

In the vicinity of Wilberforce, ochres of fair quality occur that are likely to find a market in the future. A deposit of probable commercial value is reported at a point east of Minaki.

Prairie Provinces:

The Department of Mines states that deposits of workable size and grade exist, but no production is recorded. There is a deposit of ochre near Pakan on the North Saskatchewan River, about forty miles northeast from Lamont on the Canadian National Railways. Ochre from this deposit has been used by one paint manufacturing company. Another deposit of ochre occurs close

to the Edmonton-Athabaska branch of the Canadian National Railways. There are many other small deposits known to occur close to the line of railways.

Bib.—Ont. Dept. Mines' Report Vol. IX. Annual Reports Que. Dept. Mines. GSC "Geology and Economic Minerals of Canada", #2065.

NATURAL GAS

New Brunswick:

Important gas producing areas exist in the counties of Albert and Westmoreland. The main formation along which drilling has been carried on is between ten and twelve miles distant from Moncton, the main anticlinal having a general trend east and west. This gas supplies the city of Moncton and immediate vicinity.

Quebec.

No wells of any great magnitude have been the result of drilling in this province, though from time to time a small production has resulted from the putting down of wells; in the main their output has been very light.

Ontario:

The oldest natural gas-producing district is found bordering on the eastern and northern shores of Lake Erie, the counties of Haldimand, Welland, Norfolk, Elgin, Essex and Kent; the gas horizons extending into the Clinton, Medina, Trenton and Guelph formations.

Alberta.

During the past few years drilling for oil has been carried on actively, as a result of which quantities of natural gas have been discovered. It is being produced in increasing quantities, particularly contiguous to the main lines of the Canadian National Railways in the Viking-Fabyan field, also at Wainwright. The Viking field covers in the neighbourhood of forty square miles; the capacity in reserve is estimated at 60,000 millions cubic feet. In the southern part of the Province, that which may be generally termed the Medicine Hat and Bow Island fields, are heavy producers. The development in the Turner Valley is too well known to need description. For a number of years there have been gas wells along the Athabaska River, amongst the most notable being the one at Pelican Portage, which was left uncapped for many years.

Bib.—GSC "Oil and Gas Fields of Ont. and Que." Memo. #81; Sheep River Gas and Oil Field, Alta.", Memo. #122; "Gas and Oil Fields of Alta., Sask. and Man.", Memo. #116; GSC Summary Report 1917, Part "C". Dom. Dept. Mines: "Petroleum and Natural Gas", Vols. I and II, #291; "Natural Gas in Alta.", #616A; "Helium in Canada", #679. Dom. Dept. Mines' Investigation of Min. Res. and the Min. Ind. 1925, "Natural Gas in New Brunswick" and "Natural Gas and Petroleum in Northern Alberta". Ont. Dept. Mines' Reports.

OIL SHALE

In recent years, due to the decreasing reserve supply of petroleum, attention has been directed to the possibilities of utilizing Canadian shales for the production of oil. Some of these deposits, especially those of New Brunswick and Nova Scotia, are being carefully investigated. They represent an immense

tonnage of shale that, it is reasonable to believe, will form the basis of a large and lucrative industry.

Nova Scotia:

In this Province, the shales of Pictou and Antigonish counties are classified as torbanites; the deposits are of great extent, the field extending over an area of 12,000 acres. The shales of these counties are found in rocks of Carboniferous age; those in Pictou county, however, are the more important. The most recent investigations indicate that no less than two thousand million tons of torbanite are available. An estimate places the deposits in and around McLellan's Brook alone at 100 million tons of shale, readily accessible by mining or open-cut workings, over an area of 2,000 acres. Analyses have shown that the yield of crude oil as the result of samplings range from 30 to 90 gallons and 60 lbs. of sulphate of ammonia to the ton.

New Brunswick:

Important deposits of oil shale are found in Albert and Westmoreland counties. Boring and other development work indicates that the bands in this area vary in thickness from a few inches to more than 25 feet. Analyses indicate a petroleum yield of from 24.2 to 100 gallons per ton of shale; the yield of ammonium sulphate varies from 26 to 100 lbs. to the ton. Explorations which have been carried on by diamond drilling at Taylorville, Albert Mines, Baltimore and Rosevale in Albert County, have proved commercial deposits to a depth of 1,500 feet, covering an area of many square miles. Mr. James A. Robertson of Edinburgh, in a report made previous to any diamond drilling, stated that "it will be noted that the stratigraphical position of the shale beds is identical with the position of the shale seams of Scotland; I am satisfied that the supply of shales is practically unlimited and that there are 30 million tons of shale, sufficient to give an output of 1,000 tons per day for 100 years in a small portion of one leasehold alone, readily accessible by mining or open-cast working". In another report by an eminent engineer, it is stated that the estimated minimum quantity of readily accessible shale in the Rosevale and Baltimore districts of a certain company's holdings, upon which he was reporting, was from 145 million to 150 million tons, "much of which can be mined with a steam shovel".

In the Albert Mines, the beds are traversed by a nearly vertical vein of albertite, a hydro-carbon that was mined extensively at one time. New uses are being found for this mineral and it may in the future replace gilsonite, which is imported in large quantities from the United States.

Quebec:

Oil shales carrying from 20 to 36 imperial gallons of petroleum and sulphate of ammonia 22 to 59.5 lbs. per ton occur in Gaspe County on the York and St. John Rivers. According to reports of the Dominion Department of Mines the shale bands are irregular in thickness and lacking in continuity.

Ontario:

Oil shales are found in the southwestern peninsula of Ontario. In 1859 an attempt was made to utilize the shales near Collingwood, but the competition of well petroleum from the then newly-discovered oil fields in

Southwestern Ontario and Pennsylvania made the operation unprofitable. In Northern Ontario, adjacent to the Metagami and Abitibi Rivers, bodies of shale occur on which tests show a yield 7 to 16 gallons of petroleum and from 18.8 to 38.6 lbs. of ammonium sulphate to the ton.

Prairie Provinces:

Petroliferous shales occur throughout the Manitoba escarpment, which may possibly prove of commercial value. They also occur in Northern Saskatchewan; it has, however, been estimated that the yield of the latter would not be more than from 8 to 20 gallons of petroleum and from 3 to 5 lbs. of sulphate of ammonia to the ton of shale.

Bib.—Dom. Dept. Mines: "Analysis of product from Albert Mines, N.B., #479; Analysis of product from Ontario, #480; "Analysis of product from Saskatchewan, #481; "Methods and Apparatus for analysis", #59; "Oil shales Nova Scotia and New Brunswick, also Scotland", #55; GSC "Geology and Economic Minerals of Canada", #2065.

PHOSPHATE

Apatite, commonly known as phosphate rock, is used as a raw material in the manufacture of acid phosphate and of phosphorus. The phosphate rock, treated with sulphuric acid, produces a soluble phosphate of great value as a fertilizer. In Canada, the phosphate deposits are usually found associated with a very old series of rocks, granite and gneiss; the more important deposits in crystalline limestone occur in veins and pockets. Some of these bodies being irregular in size and shape, though containing rich apatite, are too expensive to mine owing to the quantity of country rock that must be handled in order to secure a relatively small amount of phosphate. In other producing countries, such as the United States, and Northern Africa, the deposits are of a sedimentary character; occur near the surface of the ground and can be easily and cheaply mined, in many places steam shovels and dredges being used for the purpose.

Fom 1870 to 1893, quantities of phosphate rock were mined in Canada, the output in 1889 amounting to nearly thirty thousand tons. Due to the competition of Florida and Tennessee and countries where lower grade but more cheaply mined sedimentary phosphate rock was produced, the Canadian industry gradually dwindled to a little more than a by-product of mica mining. Changes in conditions, however, will in all probability bring about the resumption of production. A new demand has been created in Germany that is likely to favourably affect this class of mining, due to a process that has been introduced in Bavaria whereby phosphorus is produced without the use of sulphuric acid; the Canadian product lends itself better to this process than other classes of phosphate rock, due to the presence in it of fluorine, which is an essential in this process. Further, by the introduction of the "Cottrell Process" of smelting phosphate rock with sand and coke, where electric power is available, a superphosphate is produced which effects a saving in freight rates, on account of the lesser bulk to be transported. The cost of this process has been estimated at 3.39 cts. per lb. of P_2O_5 with hydro-electric power at $25.00 per h.p. per annum, or, at 2.49 cts. per lb., if oil is used in place of the electric arc.

Experiments have shown that ground phosphate rock can be used with advantage as a fertilizer, although the phosphorus content, particularly the crys-

talline apatite of the Canadian deposits, would appear to be more or less insoluble; yet, it has been shown that when the rock is finely ground and mixed with manure it is productive of increased yields.

Ontario:

The most important bodies opened in this Province occur in North Burgess, county of Lanark, between the 5th and 9th concessions. The principal development took place on Lot 10 in the 6th and between Lots 1 and 6 in the 8th concession, in the vicinity of Ctty Lake, north of Rideau Lake, where some 15,000 tons have been produced. In Frontenac county, on Opinicon Lake, two properties of some magnitude were opened up and worked for a number of years and still hold commercial possibilities. In Loughborough township, a number of deposits have been worked from time to time. These occurrences are in the vicinity of Gould and Draper Lakes, west of Perth Road station. The apatite veins in Bedford township, though numerous, are of smaller extent.

Quebec:

While phlogopite mica and phosphate occur in Canada in intimate association it is seldom that the two minerals are present in large quantities in one and the same deposit and one tends to give way to the other; thus, where a large development of apatite has taken place, mica is more or less absent and vice versa. A notable exception to this rule is observed in many of the mines in the vicinity of the Lièvre River. The richest phosphate bodies discovered in the Province of Quebec lie in the township of Portland West, west of the Lièvre River; in the township of Templeton; and in the township of Buckingham. Other deposits have been worked in the township of Wakefield, east of the Gatineau River.

Bib.—GSC Summary Reports 1913 and 1916. Dom. Dept. Mines' "Phosphate in Canada", #396; Mineral Resources of Canada "Apatite", #881. Ont. Dept. Mines' Report 1916, Vol. XXV, Part III.

PYRITES AND SULPHUR

The pyrites of Canada competes with the sulphur mines of the Gulf States, where natural brimstone is excavated cheaply in some of the deposits by steam shovel or suction. Though the final product is much the same, as far as the sulphuric acid is concerned, many operators prefer brimstone because of the lesser bulk to handle and the fact that there is no residue.

Pyrites is the principal source of sulphur for industrial purposes mined in Canada. In a pure state it contains 53.54% sulphur and 46.66% iron.

Deposits of pyrrhotite, a mineral closely related, occur in the southwestern part of New Brunswick, in Ontario and other parts of Canada. This mineral, when pure, contains about 39% sulphur.

Quebec:

The mining of pyrites in this province has been carried on for upwards of forty years, the first pyrites used in a sulphuric acid plant in America having come from a mine in this province. The Quebec pyrite carries small quantities of copper, gold and silver, all of which values can be recovered by treatment of the cinder residue obtained in the acid works. Important deposits occur in the Sherbrooke district.

Ontario:

Deposits of pyrites in this province are at Bannockburn and Queensboro, Hastings County, and there are many pyritic outcrops in the counties of Lanark and Leeds. The property that has produced the greatest volume of output and which will eventually be re-opened, is located at North Pines, Kenora District; there is also a deposit near Fort Frances, Rainy River district, which is not operating at the present time. In the Sudbury district large bodies of pyrrhotite are mined by the operating companies as ores of nickel and copper; these ores are roasted before smelting.

British Columbia:

In British Columbia operations have been carried on on the Skeena, also by the Granby Consolidated at Anyox. The British Columbia pyrites are not mined for their sulphur content, but for their copper. With the development of the pulp and paper industry, the sulphur content will in the near future be saved, but hitherto there has been little market for sulphur on the Pacific Coast.

Bib.—Dom. Dept. Mines: "Pyrites in Canada", #167. Ont. Dept. Mines Reports, especially Vol. XVV, Part 1, 1907.

SALT

Common salt and its products are amongst the most important factors in the commercial and industrial life of the country; trading in salt was probably the earliest form of commerce, and may be regarded as part of the foundation upon which our civilization has been erected. Salt has been used as a medium of exchange, and nations have waged war for possession of the deposits. Salt through the sodium compounds obtained from it, is directly concerned in every day life. The clothes we wear, the food we eat, all have utilized sodium compounds in their production. By the action of electricity on brine, chlorine and caustic soda are produced. The chlorine for bleaching purposes and the caustic for the manufacture of soap and other purposes. Carbonate and bicarbonate of soda, and soda ash are prepared directly from salt by the ammonia process, and then again are employed as the base for numerous other chemicals. In addition to the chemical and metallurgical industries, salt is used as a preservative in the fishing and dairy industries, in refrigeration plants, in the dyeing and tanning industries and for domestic purposes.

Salt-producing springs exist in every province of the Dominion except Prince Edward Island. The largest industry is carried on in the southwestern peninsula of the Province of Ontario, where the beds exist in the Salina formation of the Silurian system and which, it may be noted, is covered by other strata, chiefly Devonian, for upwards of a thousand feet.

Nova Scotia:

An important industry has been developed in the Malagash Peninsula, where the salt occurs as a stratified deposit interbedded with rocks of the Lower Carboniferous period. The markets for this salt are found in the fishing industries of Nova Scotia and Newfoundland and eventually it will be in demand by the chemical industries along the Atlantic seaboard. The crude rock salt is being used successfully on the Canadian National Railways for refrigerating and other

purposes. This deposit presents an excellent opening for the establishment of an industry for the manufacture of sodium compounds and with ready access to shipping facilities, both rail and water, as well as the availability of coal for fuel, is rapidly assuming a commanding position. This salt should compete in the markets of South Africa and South America with the products of England and the Mediterranean. A potash-bearing stratum, composed of sylvite (potassium chloride) occurs on this property, which may become an important commercial factor. Already a market as fertilizer has been found for what is termed crude potash, a run-of-mine product carrying about one and a half per cent potash.

Drilling for salt has been carried on in various portions of the Province, with encouraging results. A salt bed has been disclosed by diamond drilling near Falmouth on the Dominion Atlantic Railway.

New Brunswick:

There are salt springs in the vicinity of Sussex and at Saltspring Brook, both in Kings County, and on the Tobique River in Victoria County. These springs like those in Nova Scotia, have their sources in the Lower Carboniferous rocks. In drilling for natural gas at Gautreau, on the east side of the Petitcodiac River beds of salt were penetrated for a distance of five hundred feet, one strata alone being one hundred and fifty feet in thickness.

Ontario:

The discovery of salt in this province was more or less accidental and occurred in 1865 near Goderich, where the discovery was made in boring for oil. Since then the deposits have been found to occupy a buried basin along the shores of Lake Huron, underlying an area of over 2,500 square miles in the counties of Essex, Lampton, Middlesex, Huron and Bruce, in which the beds of mineral reach a thickness of 250 feet, sometimes separated with partings of shale.

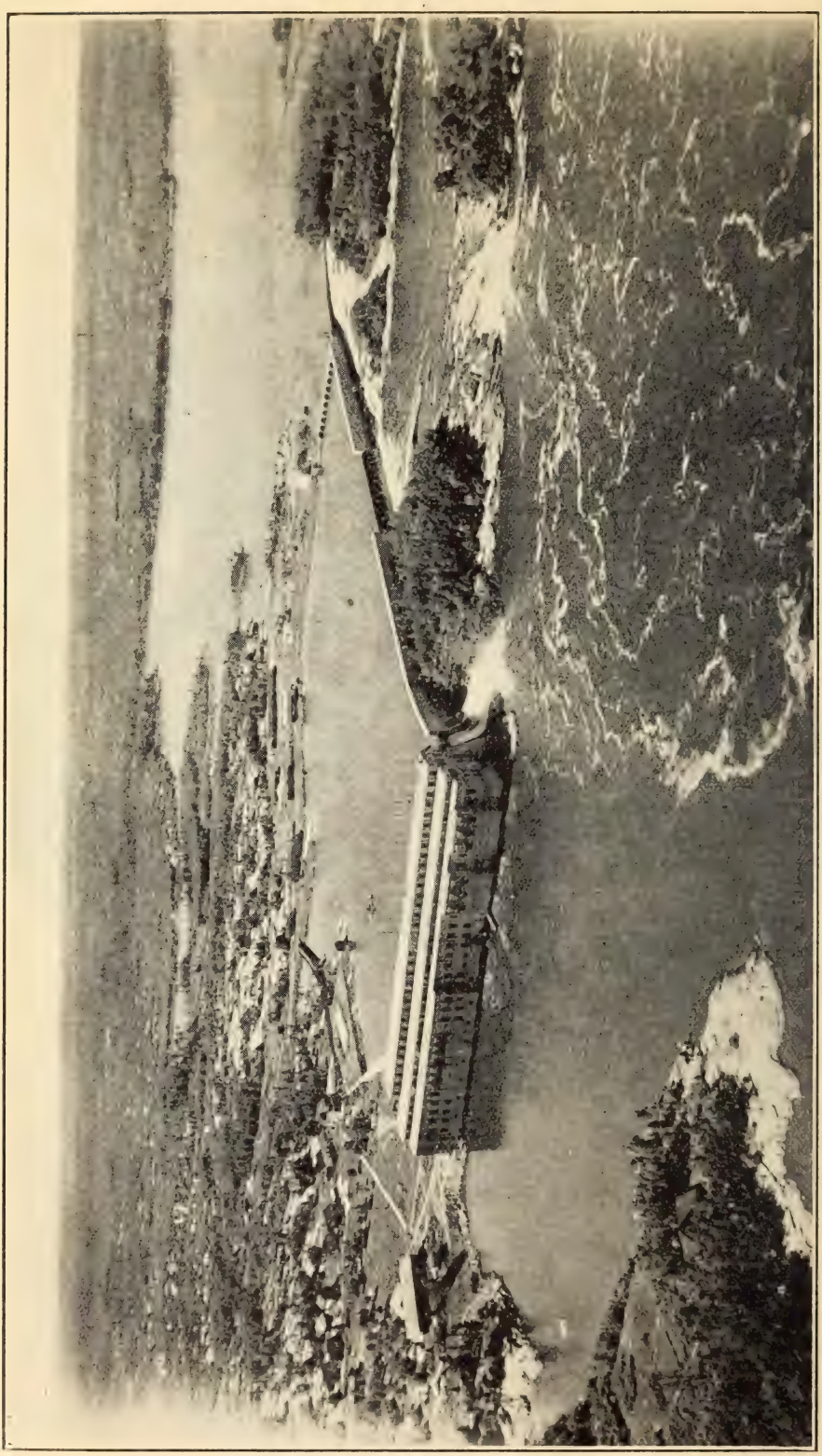
The salt is recovered by taking advantage of natural flows of underground water or by forcing fresh water down the wells—the brine being pumped to the surface and evaporated.

Manitoba:

Brine springs are found at the northwestern part of Lake Winnipegosis, at Salt Point near the mouth of the Bell River, which empties into Dawson Bay. Salt springs also occur on the Red Deer Peninsula in the southern part of the lake. Salt was manufactured here as early as 1820, but there has been no production in recent years.

Alberta:

There are a number of saline springs in the northern part of the Province and deposits of salt of commercial value. These deposits suggest the possibility of industries that may be developed in years to come, in conjunction with other natural resources of the country. As pointed out in connection with the salt of the Maritime Provinces, these deposits would form the basis of important chemical industries. They could be utilized in conjunction with the natural gas and water powers on the Athabaska River.



Power Station, Winnipeg River

The Alberta Government has drilled two wells for salt, one at Fort McMurray, near the junction of the Clearwater and Athabaska Rivers, and another at Waterways on the Alberta and Great Waterways Railway. In the McMurray well one bed of pure salt, fourteen feet thick and analyzing over 98 per cent sodium chloride, was encountered at 648 feet. Other thinner beds of salt, gypsum and anhydrite occur from this depth to the bottom of the well at 685 feet. In No. 2 well at Waterways, no beds of pure rock salt were drilled through, but a strong flow of brine, with 15.5 per cent salinity, with a measured flow of 24 gallons per minute, was encountered at 666 feet.

The Alberta Salt Company, Limited, are operating a refinery at the mouth of Horse Creek, near Fort McMurray, and are producing a very fine grade of salt for the western market.

British Columbia:

A deposit has been reported near Kwinitsa; if developed to the extent anticipated, it will become of importance in connection with the Pacific Coast fishing industries.

Bib.—GSC "Malagash Salt Deposit, Cumberland County, N.S.", Memo. #121. Dom. Dept. Mines' "Salt Deposits of Canada", #325. Ont. Dept. Mines Report Vol. XX, Part I, 1911.

SILICA

Silica occurs in deposits of commercial importance in various forms, such as diatomite, vein quartz, sand, sandstone, quartzite, and flint. It is used for many purposes including the making of glass, in the manufacture of pottery, paints, as a wood filler, in scouring soaps, sand paper and sand belts; in concrete and mortar; for foundry and furnace work; and in the making of sodium silicate or water glass. One of the most important uses of sand and crystalline quartz is in the production of silicon and the alloys of silicon, iron, copper and other metals in electric furnaces.

A new application is in the making of pure silica glass, the expansion index of which is so low that it may be made red hot and dropped into cold water without cracking. This glass has peculiar physical properties which make it of value in certain work in hospitals. Silica is also the principal constituent in ordinary glass, comprising from 52% to 65% of the mass of the original mixture. The quality of the glass, transparency, brilliance, colour and hardness depend largely on the quality of the sand. An authority on the subject states: "The suitability of sand for making glass may be determined roughly by inspecting it for the following properties: the sand should consist almost entirely of quartz, or silica (most glass sands contain from 98 to more than 99 per cent of silica); it should be nearly white or easily washed white; the grains should be uniform in size, either angular or rounded, and preferably should not be larger than 20 mesh nor smaller than 80 mesh. Whiteness is not essential, however, in sand for ordinary window glass and cheap bottles and jars".

While deposits of this mineral are found distributed nearly all over Canada, so far very little of it has been found of sufficiently high quality or of the character required for the manufacture of high-grade glass, with the result that most of the sand used in Canada for this purpose is imported from the United States, the major portion from Illinois and Pennsylvania.

Maritime Provinces:

The most important deposits of silica found in Nova Scotia and New Brunswick are in the form of quartz, quartzite, sandstone, sands and diatomite. In Cape Breton there are extensive areas of quartzites, some of which would provide suitable material for the making of silica brick. Near River Denys is found a sand that is very pure, a quantity of which has been shipped to Sydney, N.S. and Montreal for foundry purposes.

In New Brunswick there are several localities where sandstones and sands, high in silica occur, which may be suitable for commercial purposes. Large quantities of diatomite are found in both Nova Scotia and New Brunswick, but the market in Canada is at present somewhat limited, though expanding. One proposal for the utilization of diatomite is in the manufacture of sodium silicate and this will undoubtedly be brought about if, and when, the proposed chemical industries are established, based on the salt and coal deposits.

Ontario:

From reports of geologists engaged in the field in 1921, it would appear that in the county of Leeds white Cambrian sandstone is found that may be suitable for high-grade glass making. In the vicinity of Newboro a deposit is reported which will probably lead to an early development. On account on the wide market for this product, a profitable field for investigation presents itself.

Manitoba:

Silica sand is found on bars in Lake Winnipeg that will run 98 per cent pure silica. On account of the fineness it has not been found adaptable to the making of glass. Investigations are being carried on whereby a wider use of the sand of the Province may be found. For foundry purposes, in brick-making and in the glass industry at the present time, sands are imported into the Province, though the growth of the demand for Manitoba moulding sands is a source of encouragement.

(See also "Diatomite")

Bib.—GSC "Geology and Economic Minerals of Canada", #2065. Dom. Dept. Mines' "Silica in Canada, Its Occurrence, Exploitation and Uses", #555. Ont. Dept. Mines Reports.

TALC

Talc is an hydrous metasilicate of magnesium; its resistance to the action of heat and acid gives it a wide range of use and some application can be found for nearly all grades: thus it is important that investigation be made of any known occurrence. The higher grades are used in toilet powders, shaving cream and as a paper filler; as a base for heavy lubricants, soap adulterants, dressing and sizing for cotton and leather. Talc is also used for lining fireless cookers and in fire-resisting paints. Where a deposit is such that the product can be sawn in larger slabs, it is used for laundry tubs, sinks and table tops, switch boards, sanitary appliances, etc. Talc occurs in highly crystalline rocks, schists and gneisses. Talc or bodies of talcose mineral or soapstone have been found in many places in Canada, but up to the present time have only been mined to any great extent in the Province of Ontario.

Ontario:

At Madoc extensive operations have been carried on for a number of years, where a high-grade talc has been produced suitable for toilet preparations and as a paper filler. A mine has also been operated at Eldorado and for a time shipped extensively.

On account of the absorptive qualities of talc, the output of some of these properties has found a market in the paint industry, most of the product being shipped to the United States. Of late years talc of the quality mined in these districts has been used to take the place of lithopone as a rubber filler.

A valuable talc is that which is so uniformly fine-grained that it can be readily cut and bored for the purpose of making gas tips and similar articles, also crayons used in marking iron and steel, and furnace linings. A product of this character is being mined near Mine Centre, Ontario, and is of high grade. It is the intention to manufacture the product for the domestic and U.S. markets.

British Columbia:

A talc deposit, known as the Eagle mine, is being operated at Mileage 34, of the Victoria-Cowichan line, Vancouver Island. This property is situated on Wolfe Creek, about half a mile from the confluence with the Sooke River.

The formation has been described as a belt of schists and slates which extend across the Island from Goldstein River to Fort Renfrew, where it is ten miles wide; at Wolfe Creek, it is three miles wide. (See G.S.C. Memoir 13, "Southern Vancouver Island.")

While no other deposit of the same degree of purity and colour as the Eagle claim has so far been discovered, it is probable that this belt will support other similar operations. The product, after crushing and grinding, is marketed as a rubber filler, also for use in roofing and as a pigment.

Bib.—GSC "Talc Deposits of Canada", #2092; GSC Guide Book No. 6, Int. Geolog. Congress, 1913 (Madoc). Ont. Dept. Mines' Annual Reports 1900 to date.

TABLE SHOWING THE MAIN DIVISIONS OF GEOLOGICAL TIME

Era or Group		Period or System	Epochs
Quarternary	Age of Man	Recent Glacial (Pleistocene)	Extensive glaciation of northern part of North America.
CENOZOIC Tertiary	Age of Mammals	Pliocene Miocene Eocene	Lignite in B. C., Alta., Sask. and Man. Mercury in B. C., Rocky Mts. uplifted
MEZOSOIC, or Secondary	Age of Reptiles	Cretaceous Jurassic Triassic	Lignite in Alta., Sask. Anthracite and Bituminous coal in B. C. Folding in Rocky Mts.; Selkirk and Purcell ranges formed. Intrusions of granite. Silver-lead ores deposited in pre-Cambrian. Extensive ore deposition in B. C.
PALEOZOIC or Primary	Age of Amphibians.	Permian Carboniferous	Oil shales and coal in N. B., and N. S. Gypsum in N. B. and N. S.
	Age of Fishes.	Devonian	Construction of Appalachian Mts in Eastern Canada, and intrusion of granite batholiths in B. C. and Alta. Granite intrusions and formation of gold veins in N. S. Zinc-lead deposits in Gaspe. Gypsum in Man. Iron ore in N. S.
	Age of Invertebrates.	Silurian Ordovician Cambrian	Salt, gypsum, and petroleum in Ontario. Long period of erosion.
EOZOIC, or pre-Cambrian	Dawn of Life.	Keeweenawan Animikean Huronian Algoman Timiskamian Grenville Keewatin	Sedimentation and Igneous activity. Deposition Sudbury copper-nickel ores; Cobalt-silver ores; gold in Ontario Deposition of Cobalt series, Ontario, and of iron formation, Ontario. Bruce series. Intrusion of Granite, etc. Deposition of gold in N. E. Ontario and in Quebec. Deposition of Timiskamian series in Ontario and Quebec. Deposition of Grenville limestone, etc and of extensive iron formation. Chiefly lava flows.

TABLE OF ELEMENTS

Element	Symbol	Atomic weight	Element	Symbol	Atomic weight
Hydrogen	H	1.008	Ruthenium	Ru	101.70
Helium	He	4.00	Rhodium	Ru	102.91
Lithium	Li	6.94	Palladium	Pd	106.70
Beryllium	Be	9.02	Silver	Ag	107.88
Boron	B	10.82	Cadmium	Cd	112.41
Carbon	C	12.00	Indium	In	114.80
Nitrogen	N	14.008	Tin	Sn	118.70
Oxygen	O	16.00	Antimony	Sb	121.77
Fluorine	F	19.00	Iodine	I	126.932
Neon	Ne	20.20	Tellurium	Te	127.50
Sodium	Na	22.997	Xenon	X	130.20
Magnesium	Mg	24.32	Caesium	Cs	132.81
Aluminium	Al	26.97	Barium	Ba	137.37
Silicon	Si	28.06	Lanthanum	La	138.90
Phosphorus	P	31.027	Cerium	Ce	140.25
Sulphur	S	32.064	Praseodymium	Pr	140.92
Chlorine	Cl	35.457	Neodymium	Nd	144.27
Argon	A	39.91	Samarium	Sa	150.43
Potassium	K	39.096	Europium	Eu	152.00
Calcium	Ca	40.07	Gadolinium	Gd	157.26
Scandium	Sc	45.10	Terbium	Tb	159.20
Titanium	Ti	48.10	Dysprosium	Dy	162.52
Vanadium	V	50.96	Holmium	Ho	163.40
Chromium	Cr	52.01	Erbium	Er	167.70
Manganese	Mn	54.93	Thulium	Tm	169.40
Iron	Fe	55.84	Ytterbium	Yb	173.60
Nickel	Ni	58.69	Lutetium	Lu	175.00
Cobalt	Co	58.94	Tantalum	Ta	181.50
Copper	Cu	63.57	Tungsten	W	184.00
Zinc	Zn	65.38	Osmium	Os	190.80
Gallium	Ga	69.72	Iridium	Ir	193.10
Germanium	Ge	72.60	Platinum	Pt	195.23
Arsenium	As	74.96	Gold	Au	197.20
Selenium	Se	79.20	Mercury	Hg	200.61
Bromine	Br	79.916	Thallium	Tl	204.39
Krypton	Kr	82.90	Lead	Pb	207.20
Rubidium	Rb	85.44	Bismuth	Bi	209.00
Strontium	Sr	87.63	Niton (Radium emanation)	Rn	222.00
Yttrium	Y	88.90	Radium	Ra	226.00
Zirconium	Zr	91.00	Thorium	Th	232.15
Niobium	Nb	93.10	Uranium	U	238.17
Molybdenum	Mo	96.00			

MINERAL PRODUCTION OF CANADA

Calendar Years 1886-1926

Years	Total Value	Value per Capita	Years	Total Value	Value per Capita
	$	$		$	$
1886	10,221,255	2.23	1907	86,865,202	13.75
1887	10,321,331	2.23	1908	85,557,101	13.16
1888	12,518,894	2.67	1909	91,831,441	13.70
1889	14,013,113	2.96	1910	106,823,623	15.44
1890	16,763,353	3.50	1911	103,220,994	14.32
1891	18,976,616	3.92	1912	135,048,296	18.32
1892	16,623,415	3.39	1913	145,634,812	19.35
1893	20,035,082	4.04	1914	128,863,075	16.75
1894	19,931,158	3.98	1915	137,109,171	17.44
1895	20,505,917	4.05	1916	177,201,534	22.05
1896	22,474,256	4.38	1917	189,646,821	23.18
1897	28,485,023	5.49	1918	211,301,897	25.36
1898	38,412,431	7.32	1919	176,686,390	20.84
1899	49,234,005	9.27	1920	227,859,665	26.40
1900	64,420,877	12.04	1921	171,923,342	19.56
1901	65,797,911	12.16	1922	184,297,242	20.61
1902	63,231,836	11.36	1923	214,079,331	23.57
1903	61,740,513	10.83	1924	209,583,406	22.72
1904	60,082,771	10.27	1925	226,583,333	24.20
1905	69,078,999	11.49	1926	241,246,000	25.70
1906	79,286,697	12.81			

SOURCES OF INFORMATION

To those who may be interested in Canadian mining, attention is particularly directed to various valuable sources of information such as the publications of the Dominion Government, Department of Mines, including the Geological Survey and Mines Branch (to which frequent reference is made in this publication); to those of the Department of Mines of the Provincial Governments; the Bulletins of the Canadian Institute of Mining and Metallurgy; and to the Canadian Mining Journal. Most of these can be seen in the various libraries in London, England, in the libraries of the larger cities of Canada and the United States, including the libraries of the Canadian National Railways in Montreal, New York and London, England.

Attention is also directed to the lists published by the Division of Mineral Resources and Statistics of the Department of Mines, giving full particulars of all operating mining properties and mineral industries of Canada.

Enquiries may be directed as follows:

Vancouver, B.C.	—	Natural Resources Branch, Canadian National Railways, 736 Granville Street.
Edmonton, Alta.	—	Natural Resources Branch, Canadian National Railways, Macdonald Hotel.
London, England	—	Natural Resources Branch, Canadian National Railways, 17-19 Cockspur Street, S.W. 1.

or to

Commissioner

Department of Natural Resources,
Canadian National Railways,
Montreal, P.Q.

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